FINAL DRAFT
LANDFILL MONITORING AND MAINTENANCE PLAN
AND
POST CLOSURE PLAN
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
PRESENT LANDFILL

Prepared by:
Kaiser-Hill Company, L.L.C.
Golden, Colorado

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LIST OF ACRONYMS AND ABBREVIATIONS

AL	action level
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FML	flexible membrane liner
GCL	geosynthetic clay liner
GDN	geocomposite drainage net
GWIS	Groundwater Interception System
H	horizontal
IDW	investigation-derived waste
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measure/Interim Remedial Action
IMP	Integrated Monitoring Plan
Kaiser-Hill	Kaiser-Hill Company L.L.C.
LHSU	lower hydrostratigraphic unit
LRA	Lead Regulatory Agency
ml	milliliter
mph	miles per hour
Plan	Monitoring and Maintenance Plan
PLF	Present Landfill
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RL	reporting limit
SOP	Standard Operating Procedure
UHSU	upper hydrostratigraphic unit
V	vertical

1.0 INTRODUCTION

1.1 PURPOSE

This Monitoring and Maintenance Plan (Plan) has been prepared for the Present Landfill (Individual Hazardous Substance Site [IHSS] 114) at the Rocky Flats Environmental Technology Site (RFETS) and is designed to meet the following objectives:

1. Describe the procedures to maintain the integrity and effectiveness of the final cover, including making repairs as necessary (Section 3.0),

2. Describe the features to maintain and monitor the groundwater monitoring system (Section 4), and

3. Present the Landfill Seep and East Landfill Pond Environmental Monitoring Plan (Section 5.0).

This plan fulfills the requirements for a post-closure plan in 6 CCR 1007-3 §265.118 and the requirements of 6 CCR 1007-3 265.119(a)(3). Proposed revisions to the plan will be submitted to the RFCA parties for review and endorsement and also documented in the annual monitoring and maintenance report. All revisions to this plan require Colorado Department of Public Health and Environment (CDPHE) approval.

Under the Final Interim Measure/Interim Remedial Action (IM/IRA) for IHSS 114 and Resource Conservation and Recovery Act (RCRA) Closure for the Present Landfill (U.S. Department of Energy [DOE] 2004), a RCRA Subtitle C-compliant cover was selected to address closure of the Present Landfill. The designed cover is a geosynthetic composite cover with a rock layer to deter burrowing animals and a 2-foot-thick topsoil layer. The design included installation of perimeter drainage channels to control surface water run-on and runoff around the Landfill cover. The design also included modification of the existing Landfill seep treatment system. Construction of the Landfill cover included removing sediments in the East Landfill Pond, drying the sediments, and placing the dried sediments under the Landfill cover. Construction was completed in May 2005, with a minor drainage modification on the Landfill's east face completed in August 2005.

The major purpose of this plan is to describe the monitoring and maintenance of the remedy at the Present Landfill. Observation and maintenance of the East Landfill Pond dam, the East Landfill Pond, vegetation, groundwater monitoring wells and wetlands within the footprint of the pond will be consistent with other monitoring and maintenance plans. Those other plans, include the Pond Operations Plan (DOE 2005a, the Emergency Response Plan for Rocky Flats Dams (DOE 2005b), the Rocky Flats, Colorado, Site Revegetation Plan (DOE 2005c), the Rocky Flats, Colorado, Site Vegetation Management Plan(December 2005d), Rocky Flats Wetland Mitigation Monitoring and Management Plan (DOE 2006), and the Integrated Monitoring Plan (DOE 2005e).

1.2 FACILITY LOCATION AND UNITS

RFETS is a government-owned facility formerly used for the fabrication of miscellaneous weapons components for national defense. The 6,550-acre site is located in Jefferson County, Colorado, approximately 16 miles northwest of Denver (Figure 1-1). The Present Landfill is centrally located within RFETS, as shown on Figure 1-2.

1.3 SITE OPERATIONS

The Present Landfill is located in the No Name Gulch drainage, at the western limit of headward erosion and pediment dissection. Beginning in 1968, a portion of the natural drainage at the headwaters of the No Name Gulch drainage was filled with soil from an on-site borrow area to a thickness of approximately 5 feet to construct a surface on which to begin landfilling operations. The Landfill does not have a bottom liner. Waste delivered to the Landfill was spread across the work area, compacted, and covered with a daily soil cover, eventually filling the valley to the top of the pediment.

The Present Landfill remained in operation until March 1998, at which time it was placed in a contingent closure status and seeded to stabilize soil and control erosion. The Present Landfill occupies an area of approximately 20 acres. Waste material is generally thinnest along the boundaries and thickest along the east-west axis of the Landfill. Thicknesses range from less than 1 foot to approximately 40 feet near the eastern face of the Landfill.

Additional information can be found in the IM/IRA for the Present Landfill (DOE 2004).

2.0 SITE PHYSICAL DESCRIPTION

This section describes the physical conditions at the Present Landfill site such as topography, hydrology, climate and precipitations, hydrogeology, and site features, which include the final cover, the stormwater management system, the RCRA groundwater monitoring network, the Landfill seep, and the East Landfill Pond.

2.1 TOPOGRAPHY

The final topography of the Present Landfill is as shown on the post-construction survey (Figure 2-1). The slopes of the Landfill cover are generally between 3 to 5 percent in accordance with Environmental Protection Agency (EPA) guidance for landfill covers (EPA 2002). The east face of the Landfill has a maximum slope of 4 horizontal to 1 vertical (4H:1V). Perimeter drainage channels were built to control surface water run-on and runoff and are sloped to drain to the east of the Landfill below the East Landfill dam. A diversion berm was built at the top of the east face to direct surface water into the perimeter channels. Two additional stormwater drainage channels were built to direct surface water at the toe of the east face.

2.2 HYDROLOGY

The Present Landfill is located within the No Name Gulch drainage. Perimeter channels have been constructed around the Present Landfill to route stormwater off the cover and prevent run-on from the surrounding watersheds. On the northern side of the Landfill, the western portion of the perimeter channel runs under a perimeter road through a culvert and east into a natural drainage that eventually joins the No Name Gulch drainage below the East Landfill Pond dam. The northeastern portion of the channel empties into the same natural drainage that eventually joins No Name Gulch below the East Landfill Pond dam. On the southern side of the Landfill, the perimeter channel runs east above the East Landfill Pond and drops into the No Name Gulch drainage below the dam (Figure 2-1). A diversion berm constructed at the top of the east slope directs surface water from the cover away from the east face and into the perimeter channels. These channels and diversion berms limit runoff into the East Landfill Pond.

The East Landfill Pond covers approximately 2.5 acres. Recharge to the pond occurs from direct precipitation, groundwater discharge, Present Landfill seep flow, and surface water runoff from the surrounding hillslopes, including surface water discharge from the two riprap channels constructed on the east face of the Present Landfill. Groundwater discharge is likely limited because of the relatively low hydraulic conductivity of the underlying weathered bedrock. The East Landfill Pond discharge occurs by natural evaporation. Normal operation of the pond will be to leave the drain valve near the bottom of the pond open to maintain the water level in the pond. An emergency overflow spillway is provided in the dam, if needed.

2.3 CLIMATE AND PRECIPITATION

RFETS is located in the southern Rocky Mountains and has a continental, semiarid climate. The region is noted for large seasonal temperature variations, occasional dramatic short-term temperature changes, and strong, gusty winds that reach 75 miles per hour (mph). Mean annual

precipitation is approximately 15.5 inches, with approximately one-half of that amount occurring as snow.

2.4 HYDROGEOLOGY

In the area of the Present Landfill, groundwater flows predominantly within the upper hydrostratigraphic unit (UHSU). The UHSU is composed of materials that include the Rocky Flats Alluvium, colluvium, Valley Fill Alluvium, and weathered claystone bedrock. Unweathered bedrock claystones are included as part of the lower hydrostratigraphic unit (LHSU). The thickness of the weathered bedrock material varies considerably in the vicinity of the Landfill, ranging from approximately 4 to 35 feet. In the past, the average depth to groundwater ranged from 5 to 15 feet in surficial deposits around the Landfill.

2.5 SITE FEATURES

Site features at the Present Landfill include the final cover, the stormwater management system, the RCRA groundwater monitoring network, the Landfill seep treatment system, and the East Landfill Pond. Each of the site features is discussed in this Plan. Monitoring procedures are provided in subsequent sections.

2.5.1 Final Cover

The final cover of the Present Landfill includes the following components, beginning with the top layer:

- A 2-foot-thick soil layer to facilitate vegetation, route surface water, and protect the cover system below;
- A 1-foot-thick rock layer to deter burrowing animals;
- A 10-inch-thick rock cushion soil layer to protect the underlying geosynthetics from rocks;
- Geocomposite drainage net (GDN) to act as a drainage layer to route infiltrating water off of the cover;
- Flexible membrane liner (FML) to act as an impermeable layer and prevent water infiltration to the waste material below;
- Geosynthetic clay liner (GCL) to act as a secondary impermeable layer and also to "heal" punctures in the FML by the swelling of the GCL; and
- A 6-inch-thick GCL cushion soil layer to protect the geosynthetics above. This layer also includes a barometric vent system to equalize atmospheric pressure under the cover.

Inspection and monitoring procedures to maintain the integrity and effectiveness of the final cover are included in Section 3.0.

2.5.2 Stormwater Management System

2.5.2.1 Introduction

The stormwater management plan is presented in Appendix H of the Present Landfill Design Submittal (Earth Tech, Inc. 2004). This appendix presents the results of calculations used to determine the stormwater run-on and runoff volumes to adequately design the perimeter channels and culverts. The calculations use a 100-year, 24-hour storm event and check the capacity of this design to handle a 1,000-year, 24-hour storm event. The contributing area for storm events is approximately 54 acres.

2.5.2.2 Applications

Effective stormwater management is achieved in the system by applying the following principles:

- Protect the land surface from erosion;
- Manage run-on and runoff keeping velocities low; and
- Inspect and maintain the erosion and stormwater management practices (discussed in Section 3.0).

2.5.2.3 Erosion Control

At the Present Landfill, stormwater management features have been designed with erosion control features to limit both short-term erosion and long-term erosion (Figure 2-1). Erosion control is any practice that protects soil surfaces and prevents the soil particles from being detached by rainfall or wind. The cover is covered with NAG C125 temporary erosion mat and the cover sideslopes, perimeter channel bottom, perimeter channel sideslopes, and diversion berms are all covered with NAG SC150 temporary erosion control mat. This will limit short-term erosion until vegetation is established. Portions of the perimeter channel with steeper slopes are lined with riprap, a more robust erosion control measure. The diversion berm outfalls to the perimeter channel are also lined with riprap to prevent scouring. The cover of the cap has been seeded, mulched, and covered with erosion matting to limit erosion until vegetation is established. The east face and the portions of the diversion berms have more permanent erosion control mat (NAG C350) since the slope is longer and is more susceptible to erosion. Vegetation will also reduce the erosion on the east face.

2.5.2.4 Run-on and Runoff Control

The system has two purposes for the Present Landfill, which include:

- To collect, route, and discharge storm water run-on and runoff while minimizing unnecessary ponding and subsequent infiltration into the cover; and
- To control erosion and sediment transport.

Run-on stormwater is conveyed from west of the Present Landfill as overland flow and in intermittent, grassed waterways, then enters the perimeter channel. Other run-on is from overland flow from the contributing areas on the non-Landfill sides of the perimeter channel.

Runoff enters the perimeter channel from overland flow on the cover as well as grassed waterway flow from the diversion berms constructed on the top of slope at the east face.

2.5.3 RCRA Groundwater Monitoring Network

Six RCRA monitoring wells will be used for groundwater monitoring at the Present Landfill as discussed in Section 4.0. These wells will be monitored in accordance with the RFETS Integrated Monitoring Plan (IMP), FY2005 (DOE 2005e). Of the six wells, three are upgradient and three are downgradient of the Present Landfill.

2.5.4 Landfill Seep

A seep, known as the Present Landfill seep, exists at the east end of the Landfill. A passive seep interception and treatment system was constructed to collect the Present Landfill seep water flowing from the Present Landfill (DOE 2004). This treatment system was replaced with a similar system during construction of the cover system. This new passive treatment system will also treat groundwater from the Groundwater Interception System (GWIS) (if any) and flow from the east face subsurface strip drains. As a part of the construction of the Present Landfill (PLF) closure, the existing GWIS pipelines were routed to the seep treatment system (See Figure 5-1). The current concentrations of contaminants in the Present Landfill seep are either below or just slightly above the Rocky Flats Cleanup Agreement (RFCA) surface water action levels (ALs), and below RFCA groundwater Tier II ALs (maximum contaminant levels). Monitoring is discussed in Section 5.0.

2.5.5 East Landfill Pond

The East Landfill Pond will remain and receive the treated water from the Present Landfill seep treatment system, surface water from the east face, as well as from precipitation directly into the pond. Monitoring of the pond is discussed in Section 5.0.

2.5.6 Access Controls

Access controls will be maintained through a fence around the perimeter of the site, signs at entry points that restrict access to authorized personnel only, and warning signs in accordance with 6 CCR 1007-3 §265.14. The DOE and the U.S. Fish and Wildlife Service may choose additional access controls after site closure.

3.0 FINAL COVER AND STORMWATER MANAGEMENT SYSTEM INSPECTION AND MONITORING

This section outlines the inspection and monitoring program to be undertaken at the Present Landfill to ensure that the integrity of the cover is not compromised and continues to function as designed. Inspection and monitoring tasks will include monitoring subsidence/consolidation, slope stability, soil cover, vegetation, stormwater management structures, and erosion in surrounding features so that maintenance actions can be taken in a timely manner. In the event that actions are needed that go beyond routine maintenance and such actions require engineering design, DOE will notify the RFCA parties and will submit to CDPHE for its review and approval a proposal for appropriate action.

3.1 INSPECTION PROCEDURES

In accordance with the IM/IRA, (DOE 2004) to maintain integrity and effectiveness of the final cover, site inspections of the area will be conducted on a regular, periodic basis following construction of the final cover. In addition to regularly scheduled inspections, weather-related inspections will be conducted as follows:

- The site will be inspected after a storm event of one inch or more of rain in a 24-hour period; and
- The site shall be inspected after significant melt of a 10-inch or more snow storm assuming 10 inches of snow is equivalent to one inch of water.

Monthly inspections will be conducted for one year. After one year, DOE may propose modifying the frequency of inspections based on the data collected and discussions among the RFCA parties. It is anticipated that after the initial year, the inspection frequency may be reduced to quarterly for an additional four years. The inspection program will be evaluated at the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) review.

Inspections will be performed by qualified personnel and reviewed by a competent professional. Site inspections will encompass the following subjects, as described in sections 3.2 through 3.8: subsidence/consolidation, slope stability, soil cover, vegetation, storm water management structures, "run-on" erosion controls, and institutional controls and related matters. Inspections will be performed using a prescribed form containing a checklist of items that documents the evaluation of site conditions. The inspection form is presented in Appendix A. The inspection form will be signed and dated by the inspector and the reviewer. The findings and observations of the site inspection will be entered on the form and presented in an Annual Present Landfill Monitoring Report. Minor repairs or maintenance may be performed in conjunction with the inspection and will be noted on the inspection form.

3.2 SUBSIDENCE / CONSOLIDATION

Subsidence and consolidation at the Present Landfill largely depend on how well the waste was compacted when placed, thickness of the waste, age, rate of waste degradation, and waste composition. Waste subsidence or continued consolidation may result in differential settlement

which generally occurs when one area of waste settles more readily than another because of differences in waste composition, compaction, thickness, and moisture content. Differential settlement across the Landfill may create cracks on the surface, which would allow precipitation to infiltrate more easily. Differential settlement can also change the topography of the Landfill and create areas on the surface where ponding of water can occur. Localized waste subsidence can manifest itself in the form of cracks, depressions, and sinkholes. Construction of the final cover system included placement of engineered fills and repair of unsuitable areas. In addition, the waste was compacted when placed, and decomposition is nearly complete by measurement of Landfill gases. Therefore, cover subsidence or consolidation is of little concern. Nevertheless, differential settlement may occur.

3.2.1 Monitoring Locations and Procedures

Subsidence/consolidation monitoring will be conducted to evaluate actual settlement compared to the expected settlement calculated in the final design and to observe areas of water ponding on the Landfill surface or other indicators of differential settlement. Subsidence/consolidation at the Present Landfill will be monitored by visually inspecting the surface of the Landfill cover for cracks, depressions, heaving and sinkholes. Visual inspections will involve traversing the Landfill to gain perspective on regions of the Landfill, i.e., every square foot of the Landfill is not inspected. In addition to the visual inspections, seven settlement monuments will be installed at the locations shown on Figure 2-1. For each monument location, the calculated settlement from the final design will be established to be compared to measured settlement. These monuments will be monitored quarterly for the first year and annually thereafter. DOE may request modifications to the settlement monument inspection frequency, based on field conditions and monitoring results. Areas of observed differential settlement, including ponding will be staked, photographed, measured, and located on the Landfill site map prior to any maintenance action. Control Point 1006 will be maintained as the control for surveying the PLF.

3.2.2 Maintenance Action Activities

The maintenance actions that will normally occur to correct the effect of adverse differential settlement are to place additional soil and regrade the affected area. This action will eliminate the potential for ponding and/or correct the slope of the surface. Maintenance that addresses differential settlement will be photographed, and the area will be measured and located on the Landfill site map. Replacement soil will be Rocky Flats Alluvium as was used in the construction derived from at or near the Site.

Settlement plate data will be tabulated and the measured settlement will be compared to the anticipated settlement calculated in the final design. Should measured settlement exceed 30% of the calculated maximum settlement and be expressed as differential settlement, the area will be photographed, located on the Landfill site map, as described above, repaired and reported in the inspection reports. Should the measured settlement exceed 90% of the calculated maximum settlement and be expressed as differential settlement, a qualified geotechnical engineer will be consulted to determine a maintenance action and the results of the geotechnical engineer's evaluation will be reported to the RFCA parties. The area(s) where maintenance actions have taken place will be specifically inspected and reported during the inspections of the cover to monitor any continued subsidence. If differential settlement or localized subsidence appears to be substantial and likely to influence the integrity of the existing cover and surface water

drainage over the Present Landfill, DOE will consult with the RFCA parties and submit a plan for appropriate action to CDPHE for its review and approval.

3.3 SLOPE STABILITY

A Landfill site may be susceptible to instability due to lateral movement. Slope failures can be caused by the weight of the wastes and cover material, steeply regraded slopes, and seepage forces resulting from water infiltration. Seismic forces can also cause slope failures. Steep slopes produce less stable conditions and are more susceptible to failure. Slope failures can also occur within the waste mass, resulting in downslope sliding of the cover components. The cover system has been designed and constructed with applicable safety factors to guard against slope failure. Nevertheless, slope stability will be monitored to verify that slope failure is not in progress. In addition, if areas of slope stability concerns are found outside the boundaries of the Landfill footprint but within the general area of the Landfill, the area of the inspection will be expanded to include these areas.

3.3.1 Monitoring Locations and Procedures

Slope stability at the Present Landfill will be monitored by visually inspecting the cover system sideslopes, the perimeter channel sideslopes, the east face slope, and the area above the GWIS pipeline that was rerouted to the seep treatment system (outside the Present Landfill closure boundary) for signs of cracks, evidence of block failure, and evidence of circular failure. The inspection will categorize the observed cracking. A known seep area also outside of the Present Landfill closure boundary will also be inspected for slope stability and erosion (See figure in Appendix A). Visual inspection will involve traversing the slope to gain a perspective of the entire slope. Particular attention will be provided at the drainage divide where the east (central area) meets both the north and south areas of the east face (see figure in Appendix A). Any areas where a surface seep is identified will be photographed, marked, located on the Landfill site map and monitored for signs of slope instability. Areas that are identified during the inspections as potential slope stability concerns will be photographed, located on the Landfill site map, and staked for further monitoring. If adverse surface water flow into cracks is likely, actions such as filling the cracks or controlling surface water flows will be taken to prevent surface water from entering the cracked area. If further monitoring indicates a continued stability concern, a qualified geotechnical engineer will be consulted. In such cases, DOE will propose appropriate actions for CDPHE review and approval.

Monthly inspections will be conducted for one year. After one year, DOE may propose modifying the frequency of inspections based on the data collected and discussions among the RFCA parties. It is anticipated that after the initial year, the inspection frequency may be reduced to quarterly for an additional four years. The inspection program will be evaluated at the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) review.

3.3.2 Maintenance Action Activities

Based on the site monitoring data and consultation with a qualified geotechnical engineer, maintenance actions will be taken to address any potential slope failure at the Present Landfill that would likely compromise the remedy. The actions will include, but not be limited to, regrading affected areas, filling areas, maintaining positive drainage of surface water, creating

slopes ranging from 2 to 5 percent on top of the waste, and regrading steep sections to achieve side slopes no greater than 4:1. Areas where maintenance actions have taken place will be closely monitored and documented for further slope stability concerns. DOE will notify the RFCA parties if inspections show continued slope stability concerns in an area of the Present Landfill closure and will propose appropriate actions for CDPHE review and approval.

3.4 SOIL COVER

The cover system at the Present Landfill is designed to meet the minimum soil erosion requirements from both water and wind erosion. During the post-closure period, it is important to ensure that both temporary and permanent erosion controls are functioning properly. Regardless, the soil cover thickness may change over time due to wind and water erosion. Subsidence due to waste settlement and lateral movement of wastes or slopes may also contribute to changes in differential soil cover thickness. Monitoring of the soil cover is conducted to verify the soil cover is performing in accordance with the design and the Present Landfill system as a whole continues to meet performance objectives.

3.4.1 Monitoring Locations and Procedures

Monitoring of the soil cover at the Present Landfill will include the following:

- Visually inspecting the soil cover for erosion or deposition areas;
- Visually inspecting the soil cover for signs of burrowing animals; and
- Visually inspecting the diversion berm, diversion berm outfalls, and the east face for erosion rills or excessive deposition.

Visual inspection will involve traversing the slope to gain perspective of the entire area. Particular attention will be provided at the drainage divide where the east (central area) meets both the north and south areas of the east face (see figure in Appendix A). Signs of rill and gully erosion will be photographed, marked with stakes, measured and located on the Landfill site map and reported on the inspection form. Additionally, areas of observed soil deposition will also be photographed, marked, measured, and located on the Landfill site map and reported on the inspection form.

3.4.2 Maintenance Action Activities

If monitoring indicates significant loss of soil over time, maintenance actions will be taken. If a gully is measured at equal to or over 6-inches deep, maintenance actions will be implemented. Actions may include, but not be limited to, soil replacement, regrading the affected areas to match adjacent grades, and removing and relocating eroded soils (if necessary). The regraded areas will be vegetated to prevent further erosion. Erosion control measures will be implemented to prevent further erosion of cover soils, (e.g., erosion control mat, revegetation), if necessary. The amount of soil used to fill areas of erosion will be estimated, recorded and reported in the quarterly monitoring report. DOE will notify the RCRA parties if soil erosion concerns persist, and will propose appropriate actions for CDPHE review and approval. Areas of soil deposition that hinder the flow of surface water in a stormwater channel will be removed to maintain the

designed channel configuration and flow capacity. Maintenance of these areas will also be documented and reported in the quarterly report.

3.5 VEGETATION

Vegetation is important at the Present Landfill to aid with short-term and long-term erosion control although the design calculations have shown that the materials used for construction are resilient to water and wind erosion. The approved PLF IM/IRA (Section 5.1) states: "Additionally, surface vegetation will be established on this soil layer to enhance resistance to surface erosion, prevent intrusion of noxious weeds and burrowing animals, and to provide an aesthetic appearance to the cover, using appropriate native seed mixes. Section 6.1.1 of the approved PLF IM/IRA also states: "Vegetation of a soil cover is planned to further reduce erosion, although vegetation and weed control measures will be employed to maintain a healthy stand of vegetation consistent with the wildlife refuge end-state." Vegetation inspections will ensure that vegetation is established properly and will be consistent with the Rocky Flats, Colorado, Site Revegetation Plan (DOE 2005e) and the Rocky Flats, Colorado, Site Vegetation Management Plan (DOE 2005d).

3.5.1 Monitoring Locations and Procedures

The vegetation at the Present Landfill will be monitored by visual inspection and measurements as described in the above referenced document. The vegetation will be monitored by traversing the cover and visually inspecting for the health of the grasses and for unwanted vegetation such as weeds or deep rooting trees. Major goals of plan are:

Quantitative grassland success criteria:

1. A minimum of 30 percent relative foliar cover of live desired species (seeded native species and/or non-seeded native species).
2. A minimum of 70 percent total ground cover comprised of litter cover, current year live vegetation basal cover, and rock cover.
3. A minimum of 50 percent of the seeded native species will be present at the revegetation site.
4. No single species will contribute >45 percent of the relative foliar cover (except in areas where dominance by a single species is appropriate for long term wildlife and habitat management objectives).

Noxious weeds criteria

1. Noxious weeds will be evaluated on a species-specific basis, and weed control will be employed as necessary using appropriate strategies (Site Vegetation Management Plan [DOE 2005d]) to achieve the success criteria listed above.

3.5.2 Maintenance Action Activities

If visual inspections indicate vegetation concerns on the cover, maintenance action will be taken.

Actions may include, but not be limited to the following:

- Localized reseeding of the soil cover;

- Localized mowing of weeds prior to development of their seeds;
- Spot herbicide applications;
- Fertilization to maintain vitality of the grass cover; and
- Removal of deep-rooting trees and repair of the area.

The maintenance of the cover vegetation will be consistent with the Rocky Flats, Colorado, Site Revegetation Plan (DOE 2005d) site-wide vegetation management. The RFCA parties will be notified and consulted should an area consistently show vegetation concerns.

3.6 STORMWATER MANAGEMENT STRUCTURES

Stormwater management will be required at the Present Landfill to ensure that existing stormwater control structures (man-made drainage features) are functioning adequately to achieve the following objectives:

- Prevent run-on and runoff from eroding or damaging the cover; and
- Limit transport of sediment from the disturbed areas to off-site drainage ways.

Existing stormwater controls at the Present Landfill include the following (Figure 2-1):

- Diversion berm;
- Diversion berm outfall-north;
- Diversion berm outfall-south;
- Culvert 1;
- Culvert 2;
- Southwest culvert outfall;
- Vegetation-lined perimeter channel-north;
- Vegetation-lined perimeter channel-south;
- Riprap-lined perimeter channel;
- East Face riprap channel-north;
- East Face riprap channel-south; and
- C350-lined East Face.

Details of each type of structure are included on Figure 3-1.

3.6.1 Monitoring Locations and Procedures

Stormwater management structures will be monitored visually by walking the structures and examining all components. Problem areas will be noted on the inspection form, graphically

depicted, and photographed. At a minimum, these structures will be inspected for signs of excessive erosion, settlement, bank failure, breaching of the diversion berms, subsidence, burrowing animals, and blockage. Signs of potential problems include, but are not limited to, gullying, sediment build-up, and depressions.

The perimeter channel lining will be inspected for evidence of damage, displacement, undermining, scour, or deterioration. Repairs shall be made to re-stabilize the channel in accordance with the design specifications. Permanent erosion control mat lining on the east face will also be inspected. The erosion control mat will be inspected for holes, rips, and separation. In addition, any evidence of erosion rills or gullies will be monitored during the inspection.

3.6.2 Maintenance Action Activities

If the inspections indicate that the existing stormwater management structures are not adequately controlling surface water run-on and runoff, maintenance actions will be taken.

Routine maintenance of the surface water controls will include removing any blockages, filling eroded areas, replacing erosion control mat, or repairing other disturbances as necessary. Sediment will be removed from the stormwater management structures to restore the design characteristics of the structure. Areas that exhibit excessive erosion may require placement of erosion control material or strengthening of the existing erosion control measures. Should areas of stormwater management continue to show evidence of concern, the RFCA parties will be notified and consulted and DOE will submit a plan for appropriate action to CDPHE for its review and approval.

3.7 "RUN-ON" EROSION CONTROL

Erosion control inspections are to take place in natural drainages around the Present Landfill to prevent excess sediment load to the Present Landfill system and to ensure erosion is not problematic. Natural drainages and slopes around the Present Landfill to be inspected for excess erosion as shown on Figure 2-1 include:

- Natural drainage fed by Culvert 1;
- Natural drainage fed by the northeast portion of the perimeter channel;
- Natural drainage fed by the south perimeter channel; and
- Natural area sideslopes of the perimeter channel.

The inspection will include areas where flows from the channels meet the existing land surface.

3.7.1 Monitoring Locations and Procedures

The natural drainages will be visually monitored to identify signs of soil erosion that could adversely impact the Present Landfill or conditions that may cause an overload on existing stormwater management structures.

3.7.2 Maintenance Action Activities

If inspections indicate soil loss, excessive disturbance in the areas, the presence of erosion gullies, or other evidence of erosion, maintenance action will be taken. The slope areas are more susceptible to water erosion in the event of high intensity rainfall and are of particular concern. Actions may include placing additional soil, regrading, and seeding of the affected areas. Other erosion control measures that may be implemented include placing erosion mat, riprap, straw bale barrier(s), and silt fencing. The RFCA parties will be notified and consulted should areas consistently show signs of erosion and DOE will submit a plan for appropriate action to CDPHE for its review and approval.

3.8 INSTITUTIONAL CONTROLS AND OTHER INSPECTIONS

In addition to the inspection and monitoring activities discussed above, the site inspection will include assessment of other items that may need attention, such as institutional controls, the condition of established monitoring points, and site security. If inspections reveal violations of the institutional controls DOE will submit a report evaluating the matter and proposing appropriate action to the lead regulatory agency (LRA) for review and approval.

3.8.1 Institutional Controls

Institutional controls are used to control access and restrict activities at the Present Landfill to ensure the effectiveness of the engineered controls and the monitoring systems. Present Landfill inspections will monitor conditions that violate the institutional controls or damage the physical controls. Inspections will be conducted to look for evidence of the following activities:

- Excavation(s) of the cover and in the immediate vicinity of the cover;
- Construction of roads, trails or buildings on the cover;
- Drilling of wells or use of groundwater for any purpose other than the accelerated action;
- Disruption or damage of the seep treatment system; and
- Damage or removal of any signage or groundwater monitoring wells at the Present Landfill.

Evidence of Unauthorized Entry.

A checklist of these items is included on the inspection form found in Appendix A.

3.8.2 Condition of Monitoring Points

All established monitoring locations, such as groundwater wells and the seep treatment system or other items placed to assist inspection efforts, will be evaluated for ongoing integrity. The inspection will include documentation of any damage to the monitoring points that would impact their usefulness for inspections.

3.8.3 Site Conditions

During site inspections, signs, markers, and the overall condition of the Present Landfill site will be checked to determine continuing effectiveness of institutional and physical controls.

3.8.4 Reporting and Record Keeping

Inspection forms and findings will be included in the Annual Present Landfill Monitoring Reports discussed in Section 6.0. These annual reports will be submitted to the EPA and the CDPHE.

/

4.0 GROUNDWATER MONITORING PLAN

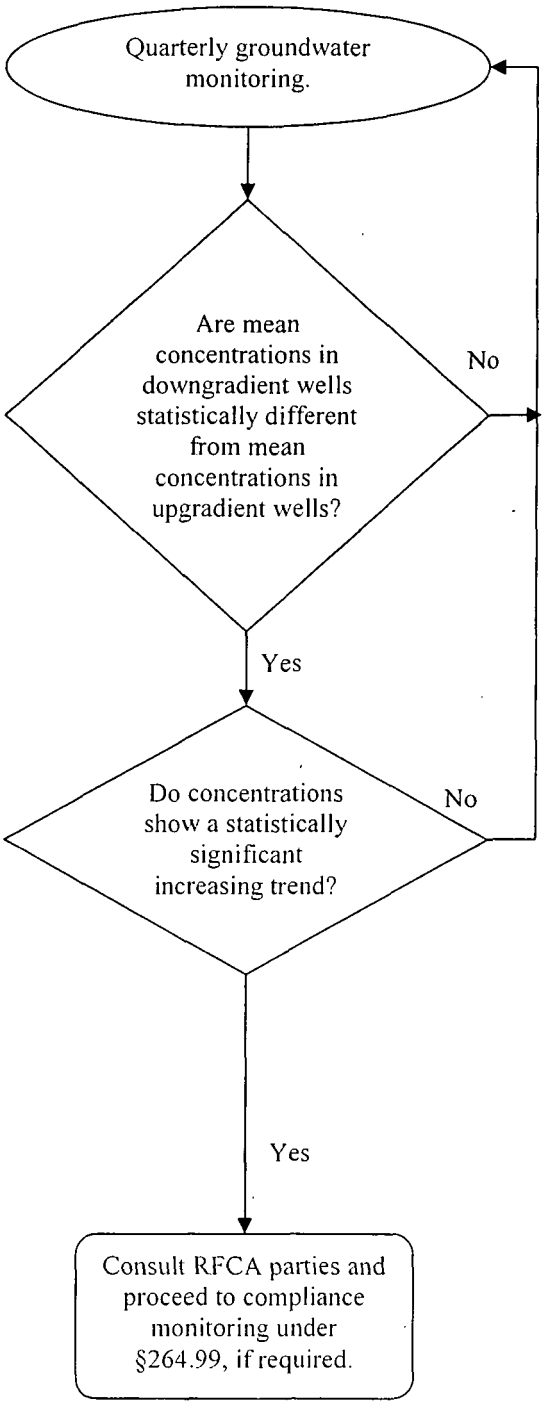
This section presents the plan to maintain and monitor the groundwater monitoring system for the Present Landfill during the post-closure period.

4.1 PURPOSE AND REQUIREMENTS

Historically, the groundwater monitoring system was implemented under the IMP (DOE 2005e) in accordance with 6 CCR 1007-3, 265.90[d]. The Present Landfill groundwater monitoring plan has been implemented to determine groundwater quality impacts of the Landfill (IM/IRA [DOE 2004]) pursuant to the detection monitoring requirements of 6 CCR 1007-3, §264.91(d) and §264.98. The constituents that will be monitored, frequency of monitoring, and other requirements of §264.98 are described in this section and in the IMP (DOE 2005e), the IM/IRA (DOE 2004), and Attachment 5 of RFCA. The groundwater monitoring will be used to evaluate upgradient versus downgradient groundwater quality at the Present Landfill and will follow the requirements of 6 CCR 1007-3, §§264.91 through 264.98.

4.2 DATA QUALITY OBJECTIVES

Detailed data quality objective (DQO) information can be found in Section 3.3 of the IMP (DOE 2005e). The DQOs were generally developed using EPA guidance documents. Groundwater monitoring wells at the Present Landfill are categorized as RCRA monitoring wells under the IMP and will proceed through the applicable decision statement outlined in Section 3.3 of the IMP (DOE 2005e). The following flowchart will be used to guide the decision statement:


Quarterly groundwater monitoring.
Are mean concentrations in downgradient wells statistically different from mean concentrations in upgradient wells?
No
Yes
Do concentrations show a statistically significant increasing trend?
No
Yes
Consult RFCA parties and proceed to compliance monitoring under §264.99, if required.

4.3 WELL LOCATIONS

Well locations have been chosen in compliance with the IMP and include a total of six RCRA groundwater monitoring wells (Figure 2-1). Locations were selected and approved by both CDPHE and EPA. Of these, three are downgradient and three are upgradient.

Upgradient monitoring wells include well numbers 70193, 70393, and 70693. Downgradient monitoring wells include well numbers 73005, 73105, and 73205. Monitoring well details are summarized in Table 4-1. Boring logs are included in Appendix B.

4.4 GROUNDWATER QUALITY SAMPLE PARAMETERS

4.5 SAMPLING PROCEDURES SUMMARY

Groundwater sampling will be conducted in accordance with RFETS Standard Operating Procedures (SOPs). The following sections summarize the groundwater sampling procedures that will be used to monitor groundwater conditions at the Present Landfill. Details include groundwater level measurements, conventional groundwater purging and sampling procedures, quality control (QC) field samples, decontamination procedures, and investigation-derived waste (IDW) management.

4.5.1 Groundwater Level Measurement

Water levels are measured to determine groundwater flow patterns, water level fluctuations, and the volume of water in a well for the calculation of purge volumes prior to sampling. Since this plan requires measuring water levels from a group of monitoring wells for hydrologic evaluation, these measurements will be conducted as a complete round, separate from any sampling efforts. The six RCRA monitoring wells will be included during water level measurements. Water levels will be measured in accordance with RFETS SOPs.

4.5.2 Conventional Groundwater Purging and Sampling

Monitoring wells will be purged before samples are withdrawn to prevent collection of non-representative stagnant water in a well. Well purging will be sufficient to increase the likelihood that the water collected is representative of the groundwater within the formation around the well. All purging and sampling operations will be conducted in accordance with RFETS SOPs.

4.5.3 Quality Control Field Samples

During implementation of the field sampling program, field quality assurance (QA)/QC samples will be collected to assess the reproducibility of the field collection techniques, the quality of preservation techniques and sample bottles, and the effectiveness of field decontamination procedures. QA/QC procedures will be conducted in accordance with RFETS SOPs.

4.5.4 Decontamination

Equipment used for monitoring and sampling must be properly decontaminated. Decontamination must effectively eliminate the potential for cross-contamination between sampling locations and must be conducted using the appropriate materials to prevent the introduction of external contaminants (such as phosphate from detergents, aromatic hydrocarbons from motor vehicles, or oil and grease from dirty hands). Decontamination will be conducted in accordance with RFETS SOPs.

4.5.5 Investigation-Derived Waste (IDW)

IDW that will accumulate during groundwater monitoring includes decontamination and purge water. The management of IDW will be conducted in accordance with RFETS SOPs.

4.6 LABORATORY PROCEDURES SUMMARY

Analytical methodologies and reporting limits (RLs), data reporting procedures, laboratory QA/QC procedures, laboratory data validation and contractor validation procedures are to be conducted in accordance with EPA-approved methods. Groundwater samples will be submitted to an EPA-approved analytical laboratory for the following analyses:

- SW-846 Method 8260B – Volatile Organic Compounds;
- SW-846 Method 6010B – Metals; and
- SW-846 Method 7470A – Mercury.

The analytical results of these methods for those analytes listed in Table 2 of RFCA Attachment 5 will be reported.

Prior to implementing procedures, the laboratory will perform an initial demonstration of proficiency as specified in the method. Once the procedure is properly understood by the analyst and acceptable quality control data (precision and accuracy) are achieved, the method is placed in the laboratory for use.

Sample results are reported according to laboratory analytical method SOPs or contract specifications. The laboratory will report any analyte of interest detected at or above the RL as a positive value. Any analyte of interest not detectable or detected below the RL will be reported as "not detected" at the RL or an estimated value between the RL and the instrument or method detection limit. Data are generally reported in a tabular format or posted on maps and figures. RLs are adjusted for dilution when necessary.

4.7 REPORTING AND SCHEDULE

Groundwater monitoring results will be included in the Annual Present Landfill Monitoring Reports discussed in Section 6.0. Groundwater monitoring will be conducted on a quarterly basis.

5.0 PRESENT LANDFILL SEEP AND EAST LANDFILL POND ENVIRONMENTAL MONITORING PLAN

As part of Present Landfill closure, a passive seep interception and treatment system has been installed to treat Landfill seep water and GWIS water. Effluent for the treatment system eventually flows to the East Landfill Pond. This section presents the monitoring plan for treatment system influent and effluent as well as the East Landfill Pond if the treatment system effluent exceeds surface water standards.

5.1 PURPOSE AND REQUIREMENTS

The Present Landfill Seep and East Landfill Pond Monitoring Plan has been implemented to determine surface water quality impacts of the Landfill (IM/IRA [DOE 2004]). Applicable surface water standards are listed in the RFCA, Attachment 5, Table 1.

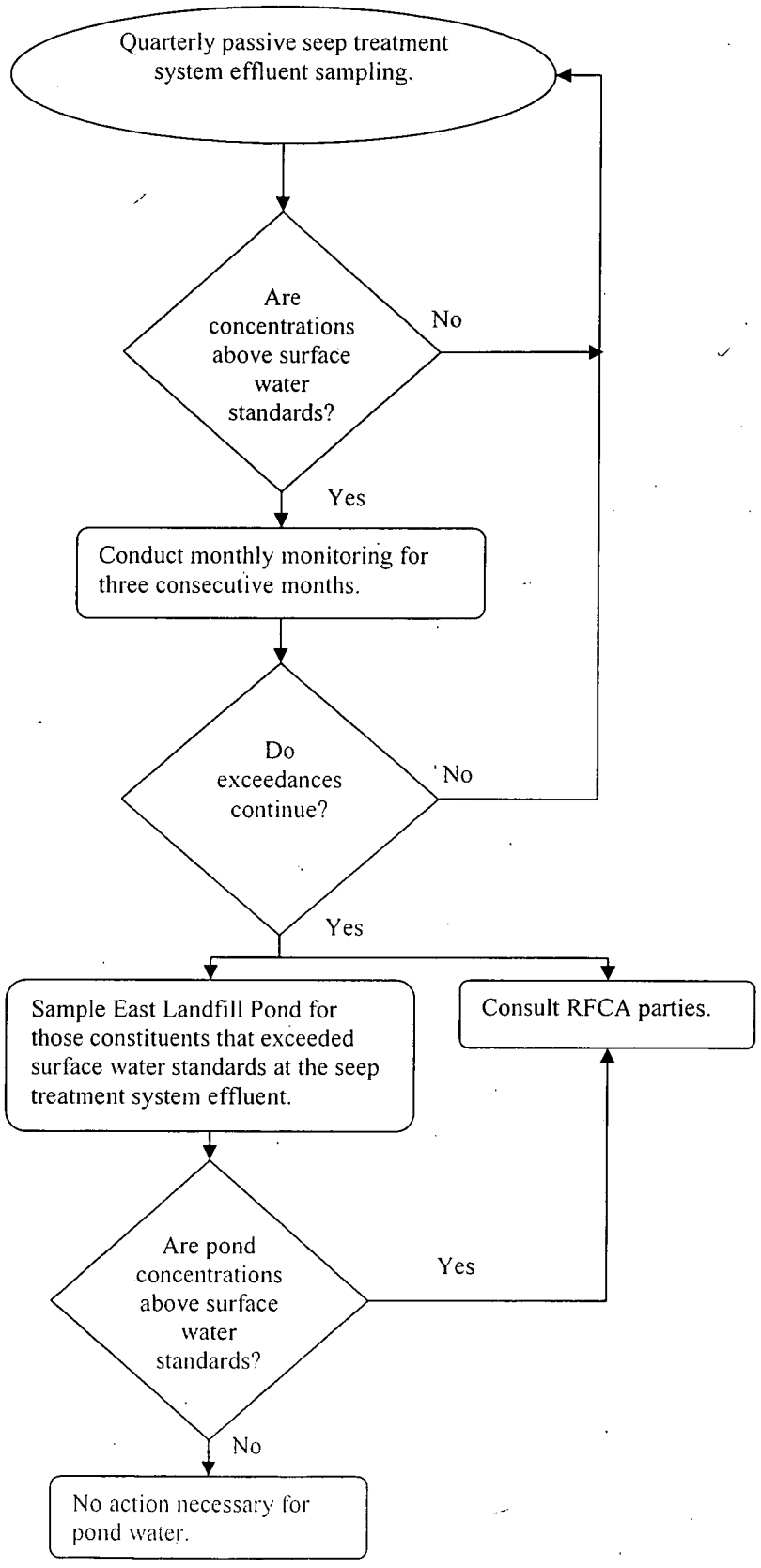
As detailed in the IM/IRA, seep monitoring requirements will consist of quarterly monitoring until the CERCLA review. A validated exceedance of a treatment system effluent limit will trigger monthly monitoring for three consecutive months. Continued exceedances during the three-month period will trigger consultation between the RFCA parties to determine whether a change in the remedy is required, additional parameters need to be analyzed, or a different sampling frequency is required.

Continued exceedances will also trigger sampling of the East Landfill Pond for those constituent standards that were exceeded in the treatment system effluent. If surface water standards are exceeded in the pond, RFCA parties will be consulted to determine if further sampling is required, if the water in the pond can overflow the East Landfill Pond dam spillway (Figure 5-1), or if another water management strategy should be applied (IM/IRA). Any surface water management decision will be made consistent with the Pond Operations Plan, after consultation with the LRA.

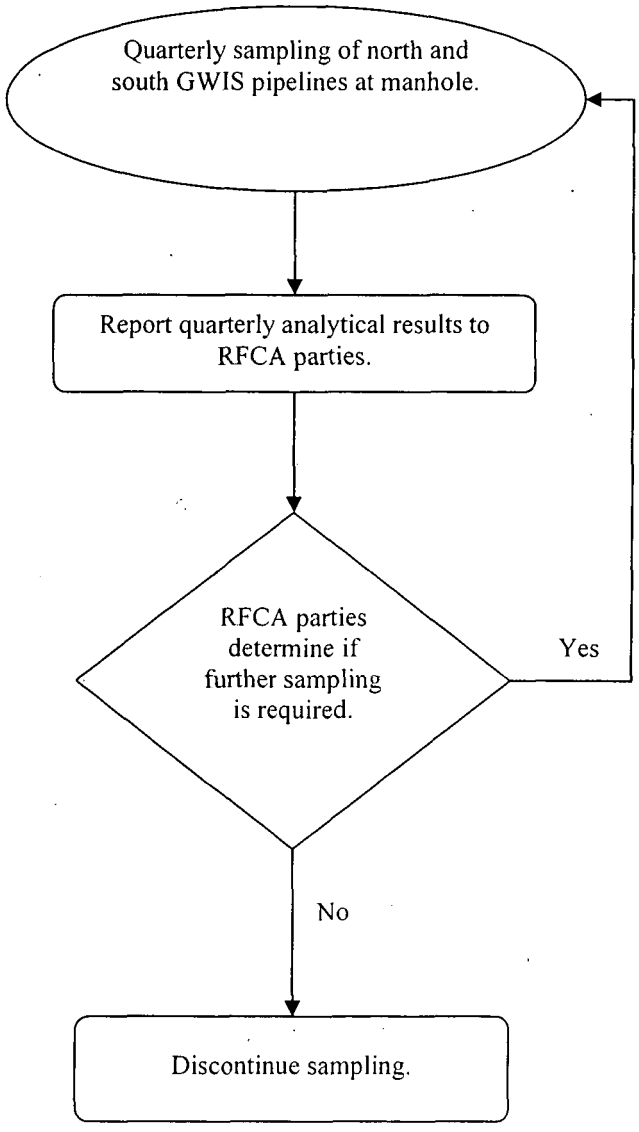
The GWIS influent (if any) into the seep treatment system will also be sampled. The water will be sampled quarterly for one year, and the analytical results will be evaluated by the RFCA parties.

5.2 DATA QUALITY OBJECTIVES

Surface water monitoring DQO information can be found in the IMP, Section 2 (DOE 2005e). The following flowchart will be used to guide the decision statement for seep treatment system effluent and pond sampling. The following flow chart will be used to guide the decision statement for GWIS sampling:


Quarterly passive seep treatment system effluent sampling.
Are concentrations above surface water standards?
No
Yes
Conduct monthly monitoring for three consecutive months.
Do exceedances continue?
No
Yes
Sample East Landfill Pond for those constituents that exceeded surface water standards at the seep treatment system effluent.
Consult RFCA parties.
Are pond concentrations above surface water standards?
Yes
No
No action necessary for pond water.

The following flow chart will be used to guide the decision statement for GWIS sampling:



5.3 SAMPLE LOCATIONS

Sampling will be conducted at both the influent and effluent of the seep treatment system as well as at the GWIS influent flow (Figure 5-1; 4 locations). Flow of the seep influent will be manually measured (calibrated bucket and stop watch) when a sample is collected. GWIS influent enters the manhole at two locations, and both will be sampled at the manhole. The effluent sample will be taken from the base of the treatment unit or after the last step.

If East Landfill Pond sampling is required as discussed in Section 5.1, a sample will be taken near the pond discharge location (Figure 5-1).

5.4 LANDFILL SEEP AND EAST LANDFILL POND SAMPLE PARAMETERS

The above described samples will be submitted for laboratory analyses as follows:

- Seep influent - metals, isotopic uranium, and VOCs;
- Treatment system effluent - metals, isotopic uranium, VOCs and SVOCs;
- GWIS - VOCs, metals, isotopic uranium, and nitrate/nitrite; and
- East Landfill Pond (if necessary) - those constituents that exceeded surface water standards in the treatment system effluent sample as discussed in Section 5.2

5.5 SAMPLING PROCEDURES SUMMARY

The following sections detail the sampling procedures that will be used to monitor seep treatment system influent, GWIS influent, and seep treatment system effluent and the East Landfill Pond, if necessary. QC field samples, decontamination procedures, sample identification, and sample handling procedures are identical to those of the groundwater sampling.

5.5.1 Sampling Procedures

5.5.1.1 Landfill Seep

When sampling the Landfill seep treatment system, samples shall be taken in the following order to prevent disturbances from upgradient samples:

- Seep treatment system effluent sample;
- Seep influent sample (including manual flow measurement); and
- GWIS influent samples (north and south separately).

When taking treatment system effluent samples, direct dipping of the sample containers without preservatives into the water to be sampled is desirable. Effluent samples that are to be preserved with chemical additives shall be collected using a properly decontaminated dipper, filtered if so specified, and poured into the sample container already containing the proper chemical preservative. Teflon® or stainless steel vessels may be used to collect samples from the effluent.

The seep influent samples shall be taken by placing the sample containers directly under discharge location inside the treatment system. Separate GWIS samples will be taken from the north and south pipes entering the manhole.

5.5.1.2 East Landfill Pond

In the event that the East Landfill Pond is sampled, pond water will be sampled using a pond sampler device. The collection suite will be dependant on effluent exceedances. The pond sampler can be purchased or simply fabricated with the following parts:

- One 250-milliliter (ml) polypropylene beaker (laboratory supply store);
- Adjustable clamp sized for 250-ml beakers (laboratory supply store);
- Aluminum telescoping tube equipped with bolt holes (swimming supply store); and
- Nuts/bolts to attached clamp to telescoping tube (hardware store).

Pond water from the sampler device will be poured directly into the sample containers. The device must be decontaminated in accordance with Section 4.5.4 between samples.

5.6 LABORATORY PROCEDURES SUMMARY

Analytical methodologies and RLs, data reporting procedures, laboratory QA/QC procedures, and laboratory data validation and contractor validation procedures are to be conducted in accordance with EPA-approved methods. Samples will be submitted to an EPA-approved analytical laboratory for the following analyses:

- SW-846 Method 8260B – Volatile Organic Compounds;
- SW-846 Method 6010B – Metals;
- SW-846 Method 7470A – Mercury;
- SW846 Method 8270B – Semi-Volatile Organic Compounds;
- Alpha Spectrometry – Isotopic Uranium; and
- EPA-600 / 4-79-020 Method 353.2 – Nitrate/Nitrite.

The analytical results of these methods for those analytes listed in Table 1 of RFCA Attachment 5 will be reported.

5.7 REPORTING AND SCHEDULE

Landfill seep and East Landfill Pond sampling results will be included in the Annual Present Landfill Monitoring Reports discussed in Section 6.0. Sampling will be conducted on a quarterly basis.

5.8 SEEP TREATMENT SYSTEM INSPECTIONS

During sampling of the passive seep treatment system, the system components will be inspected to ensure proper operation. The treatment system is shown on Figure 5-1 and includes the following components:

- Previous seep treatment system influent pipe;
- East face strip drain influent pipe;
- Concrete manholes (two);
- GWIS influent pipes (two);
- Treatment unit influent pipes (two);
- Treatment unit, which includes 10 steps; and
- Treatment unit effluent pipe.

The concrete manholes and treatment unit will be inspected for signs of damage as will the piping contained within. The influent and effluent pipes within the manhole and the treatment system effluent pipe will be inspected for signs of blockage.

6.0 REPORTING AND CONTACT INFORMATION

6.1 REPORTING

The complete Annual Present Landfill Monitoring Report, including inspection results, repairs, groundwater monitoring data, Landfill seep monitoring data, and East Landfill Pond monitoring data if applicable, will be submitted to RFCA parties. Any maintenance actions during the year will be detailed in the report. If serious conditions occur at any time that require immediate attention, RFCA parties will be notified immediately. The Annual Present Landfill Monitoring Report will include at a minimum:

- All inspection forms/reports for the year, including vegetation information;
- Notations of problems, action taken, maintenance or repairs as a result of the inspections;
- Any deviations from the Plan and the rationale for such deviations;
- Summary of monitoring locations;
- Tables with depth to water, well elevations, and groundwater elevations;
- Table with groundwater results and associated qualifiers;
- Tables with seep sampling results and associated qualifiers;
- Tables with GWIS sampling results (first year only);
- Tables with East Landfill Pond sampling results if applicable;
- Figures with groundwater monitoring points, East Landfill Pond monitoring points, and location(s) of problems and/or repairs; and
- Groundwater and seep water sampling forms.

During the year, DOE will transmit completed inspection forms as they become available, but in no case later that one month after the field activity is completed.

6.2 CONTACT INFORMATION

The point of contact and contact information for the Present Landfill during the monitoring and maintenance phase is as follows:

Scott Surovchak/Department of Energy
Rocky Flats Office of Legacy Management
12101 Airport Way, Unit A
Broomfield, CO 80021-2583
303-966-3551

7.0 REFERENCES

Earth Tech, Inc, 2004, Final Design Analysis and Design Calculations, Accelerated Action Design for the Present Landfill, October.

EPA, 2002, Technical Guidance for RCRA/CERCLA Final Covers, April.

DOE, 2004, Final Interim Measure/Interim Remedial Action for IHSS 114 and RCRA Closure for the RFETS Present Landfill, Rocky Flats Environmental Technology Site, Golden, Colorado, August.

DOE, 2005a, Pond Operations Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 2005b, Emergency Response Plan for Rocky Flats Dams, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 2005c, Rocky Flats, Colorado, Site Revegetation Plan, Rocky Flats Office of Legacy Management, Broomfield, Colorado, December.

DOE, 2005d, Rocky Flats, Colorado, Site Vegetation Management Plan, Rocky Flats Office of Legacy Management, Broomfield, Colorado, December.

DOE, 2005e, RFETS Integrated Monitoring Plan FY2005, Revision 1 Background Document, Rocky Flats Environmental Technology Site, Golden, Colorado, September.

DOE, 2006, Rocky Flats Wetland Mitigation Monitoring and Management Plan, Rocky Flats Office of Legacy Management, Broomfield, Colorado, September (in prep).

TABLES

TABLE 4-1
GROUNDWATER MONITORING WELLS
PRESENT LANDFILL
1 OF 1

Well ID	Type	Installation Date	Screen Length (feet)	Borehole Depth (feet bgs)	Well Diameter (inches)	Depth to Top of Screen (feet bgs)	Depth to Bedrock (feet bgs)
70193	Upgradient	1/15/93	15	39.4	2	22.30	19.50
70393	Upgradient	2/2/93	15	26.0	2	7.80	22.80
70693	Upgradient	12/4/92	20	30.3	2	8.50	28.50
73005	Downgradient	6/27/05	20	28.0	2	4.60	0.00
73105	Downgradient	6/27/05	20	27.7	2	5.65	12.50
73205	Downgradient	6/27/05	25	32.0	2	4.55	4.20

Notes:
bgs below ground surface

FIGURES

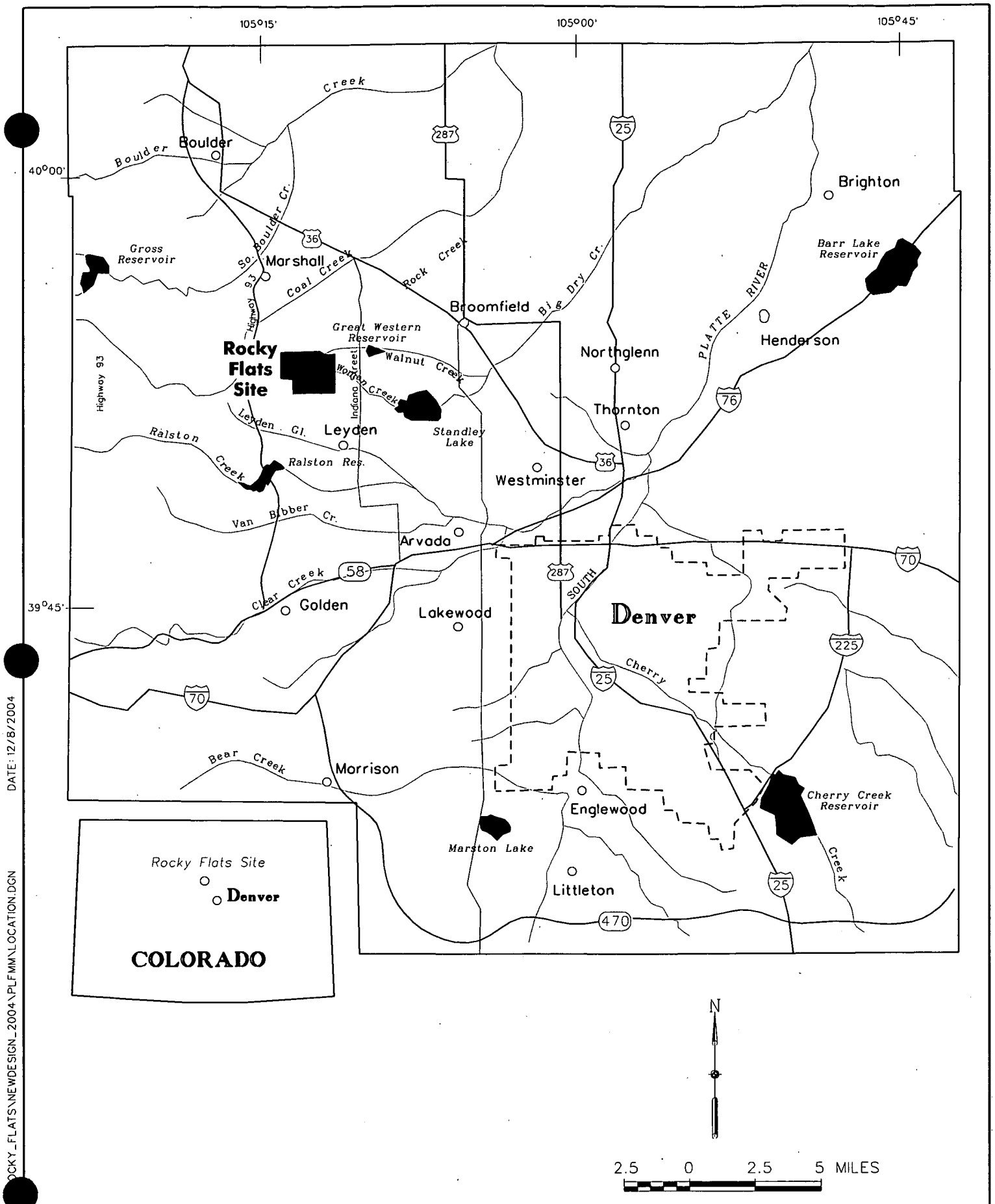


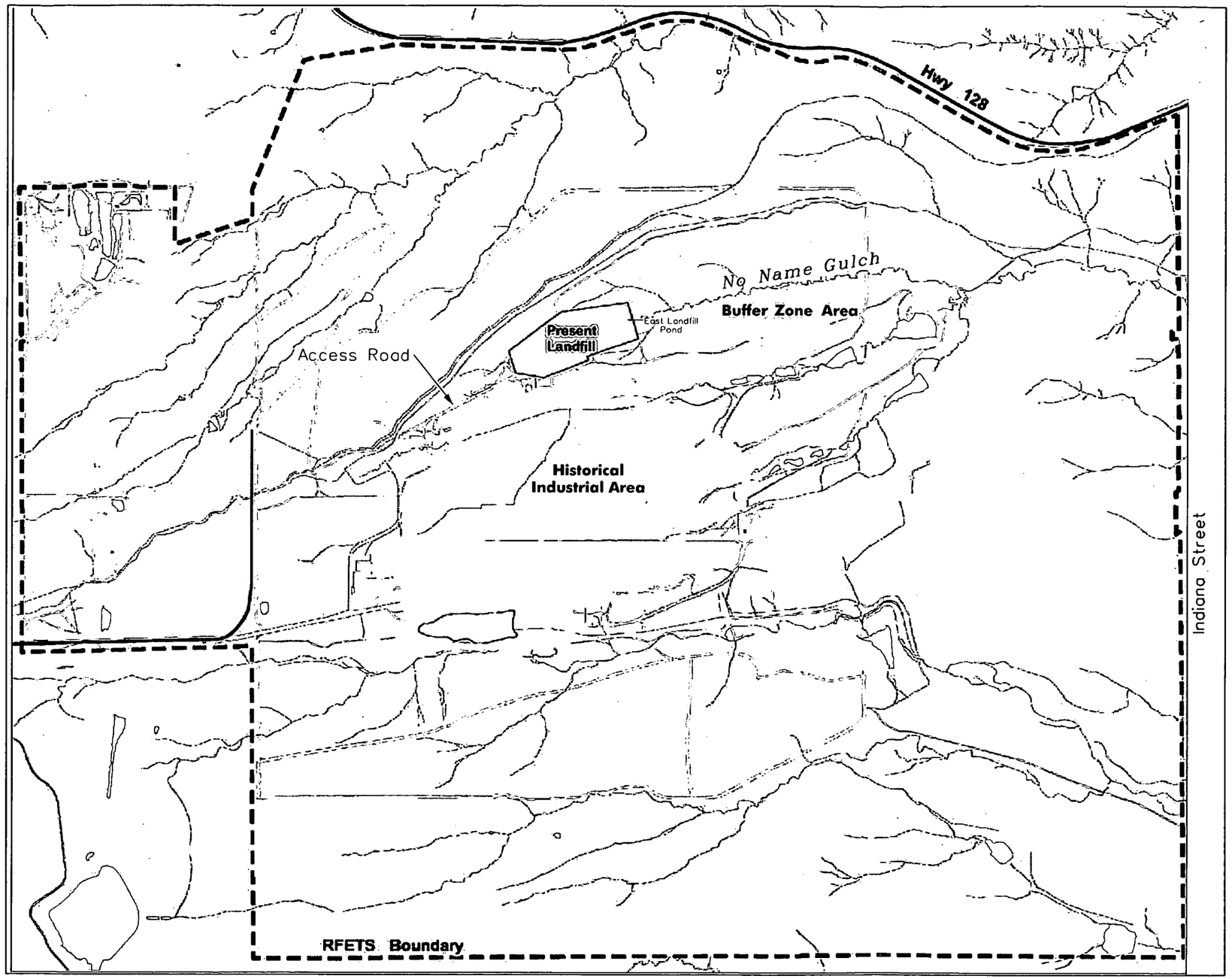
FIGURE 1-1

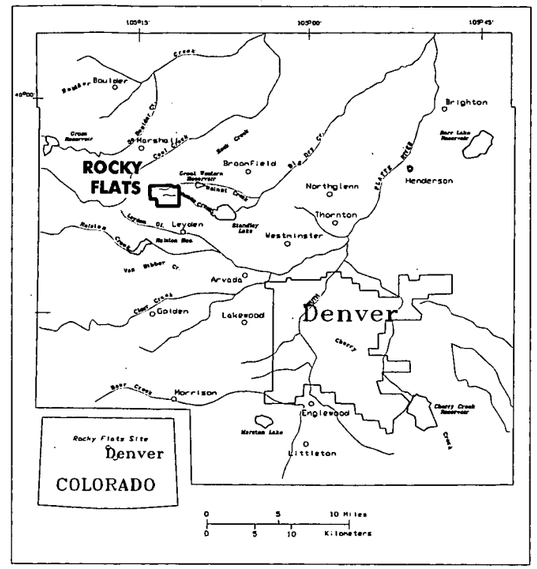
LOCATION MAP

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

EARTH TECH

CAD FILE: GROUP\C...OCKY_FLATS\NEWDESIGN_2004\PLFMMNLOCATION.DGN DATE: 12/8/2004





EARTH TECH

FIGURE 1-2

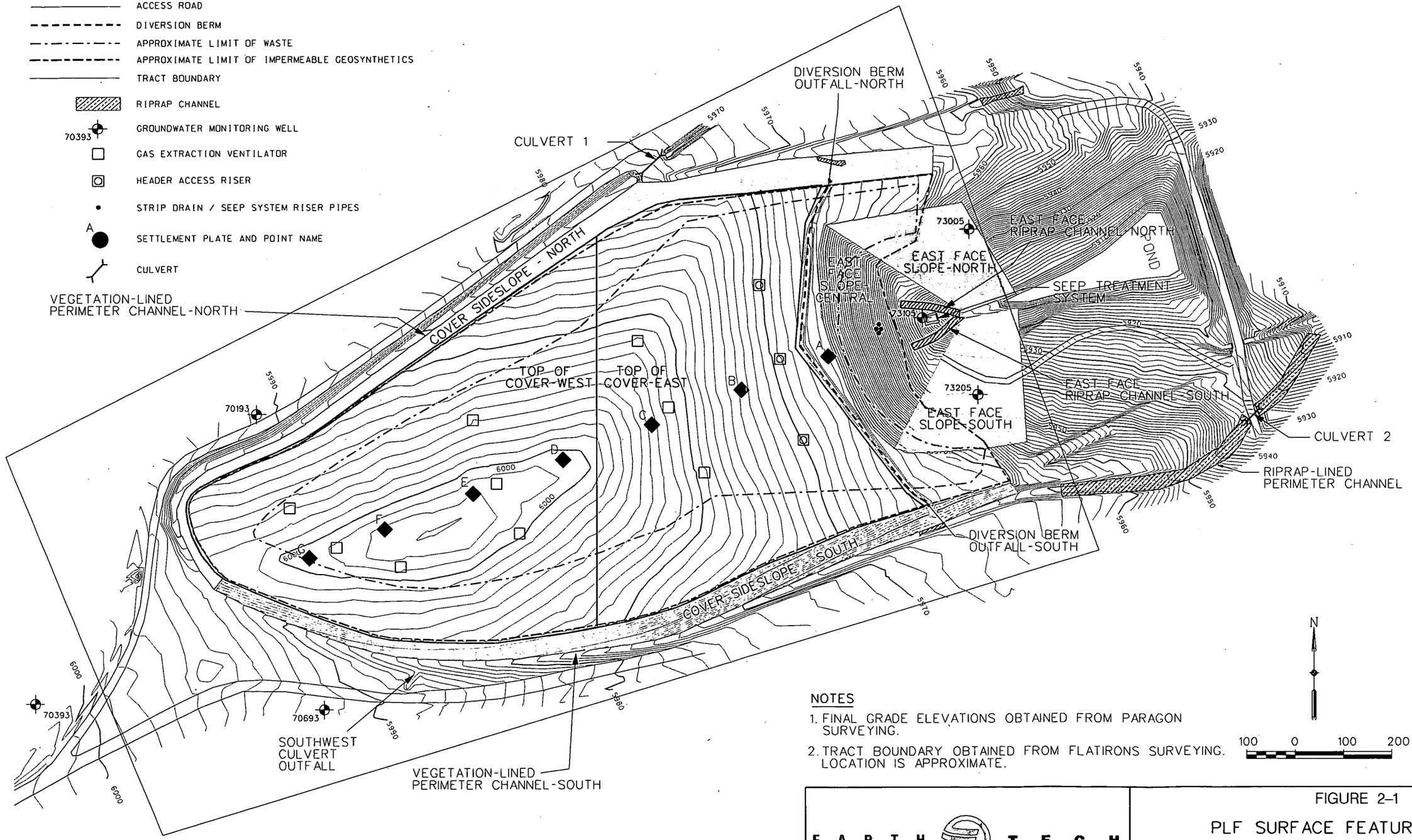
PLF SITE MAP

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

L\GROUP\CAD\ROCKY_FLATS\New_Design2004\PLFM&M\HaulRte1.dgn DATE: 8/23/05

LEGEND

- 10 FOOT CONTOURS
- 1 FOOT CONTOURS
- ACCESS ROAD
- DIVERSION BERM
- APPROXIMATE LIMIT OF WASTE
- APPROXIMATE LIMIT OF IMPERMEABLE GEOSYNTHETICS
- TRACT BOUNDARY
- RIPRAP CHANNEL
- 70393 GROUNDWATER MONITORING WELL
- GAS EXTRACTION VENTILATOR
- HEADER ACCESS RISER
- STRIP DRAIN / SEEP SYSTEM RISER PIPES
- A SETTLEMENT PLATE AND POINT NAME
- CULVERT



N

100 0 100 200 FEET

NOTES

1. FINAL GRADE ELEVATIONS OBTAINED FROM PARAGON SURVEYING.
2. TRACT BOUNDARY OBTAINED FROM FLATIRONS SURVEYING. LOCATION IS APPROXIMATE.

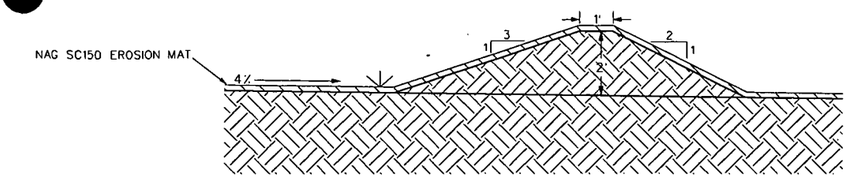
EARTH TECH

FIGURE 2-1

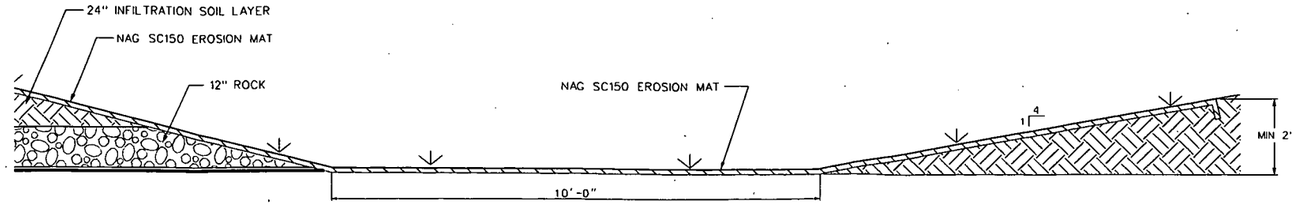
PLF SURFACE FEATURES

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

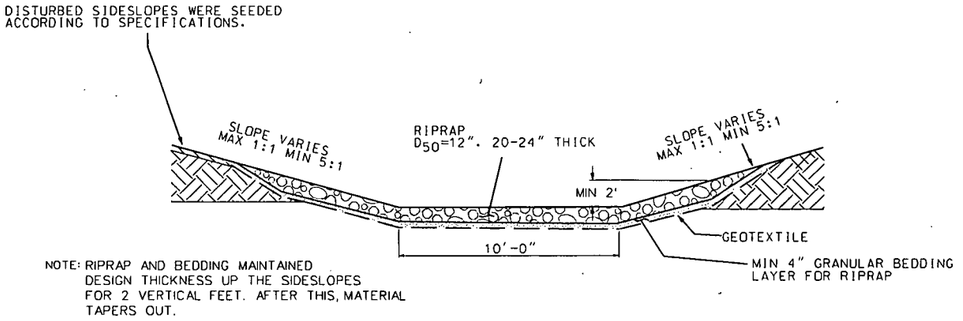
L\GROUP\CAD\ROCKY_FLATS\New_Design2004\PLFM&M\PLFRev1.dgn DATE: 1/19/06



DIVERSION BERM
NTS

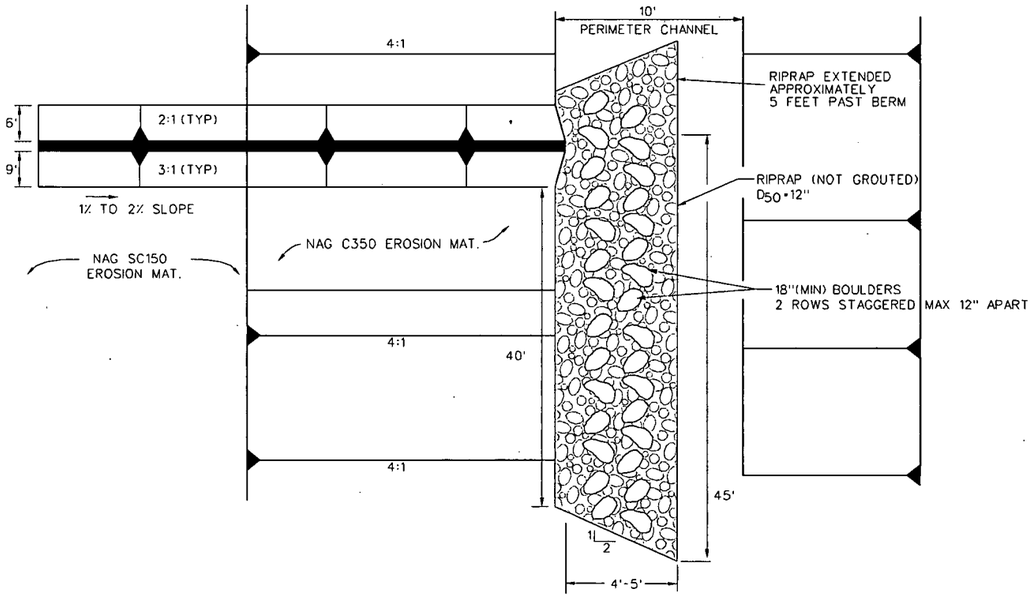


VEGETATION-LINED PERIMETER CHANNEL
NTS

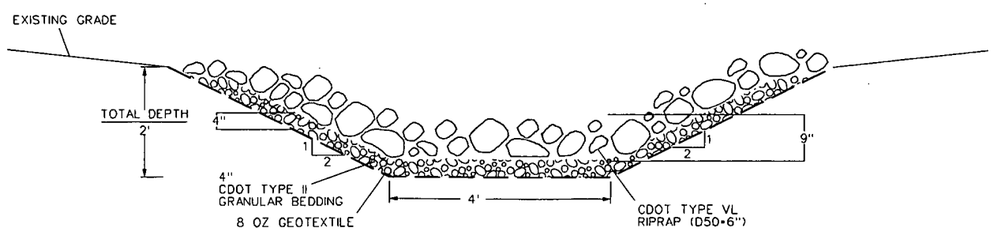


NOTE: RIPRAP AND BEDDING MAINTAINED DESIGN THICKNESS UP THE SIDESLOPES FOR 2 VERTICAL FEET. AFTER THIS, MATERIAL TAPERS OUT.

RIPRAP-LINED PERIMETER CHANNEL
NTS



DIVERSION BERM OUTFALL
NTS



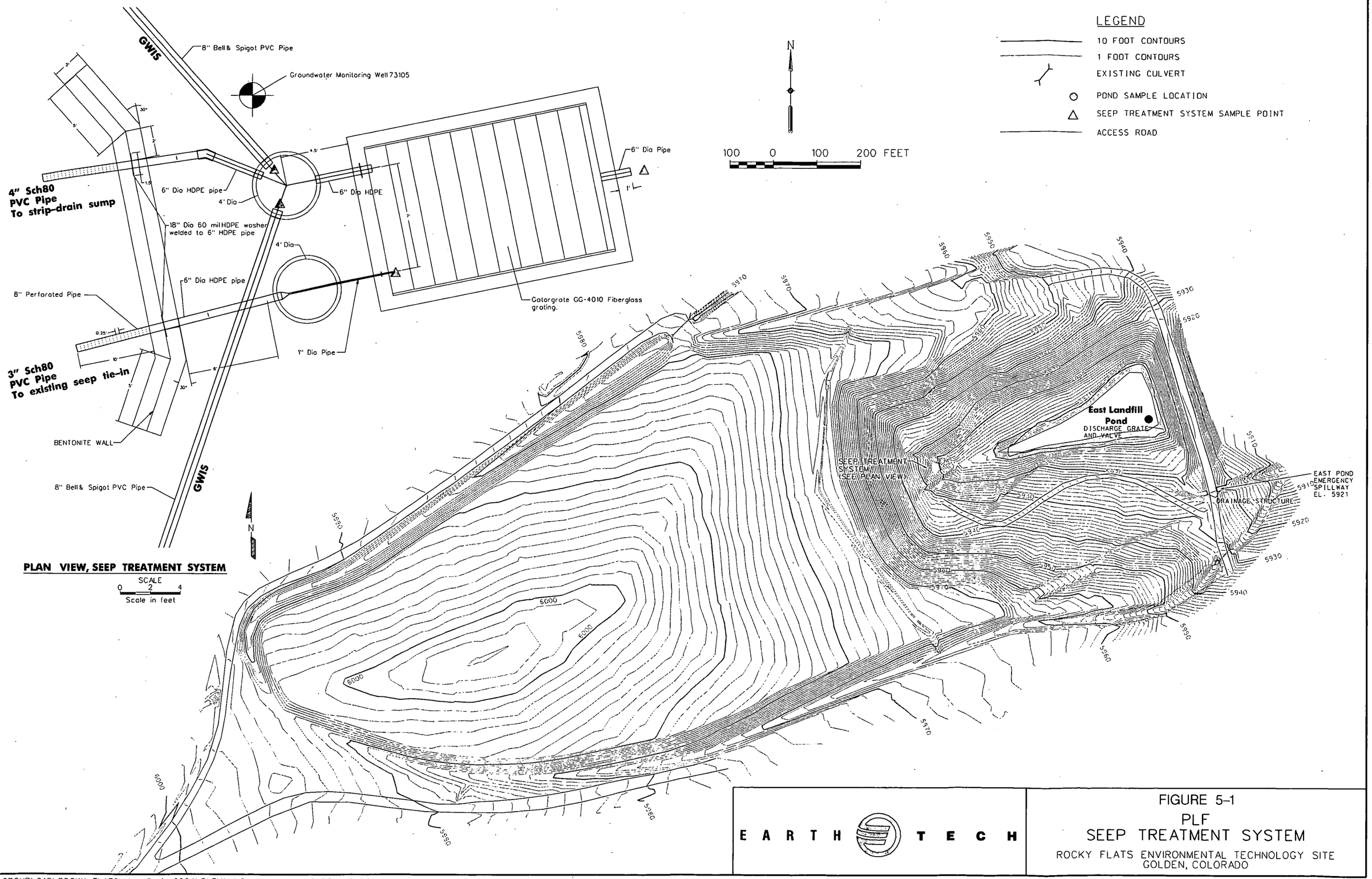
EAST FACE RIPRAP CHANNEL SECTION
NTS

EARTH TECH

FIGURE 3-1

PLF STORMWATER MANAGEMENT STRUCTURE DETAILS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO



EARTH TECH

FIGURE 5-1
PLF
SEEP TREATMENT SYSTEM
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

L\GROUP\CAD\ROCKY_FLATS\New_Design2004\PLFM&M\SeepLoc1.dgn DATE: 1/10/06

APPENDIX A

PRESENT LANDFILL INSPECTION FORM

PRESENT LANDFILL – MONITORING AND MAINTENANCE PROGRAM

INSPECTION FORM

INSPECTOR: _____ DATE: _____ TIME: _____ REVIEWED BY: _____

TEMPERATURE: _____ WEATHER CONDITIONS: _____ REVIEW DATE: _____

METEOROLOGICAL STATION LOCATION: _____

SUBSIDENCE / CONSOLIDATION

REGION	EVIDENCE OF CRACKS?	EVIDENCE OF DEPRESSIONS?	EVIDENCE OF SINK HOLES?	EVIDENCE OF PONDING?	OTHER (DESCRIBE BELOW)
TOP OF COVER – WEST	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
TOP OF COVER – EAST	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
COVER SIDESLOPE – NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
COVER SIDESLOPE – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - CENTRAL	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE – NORTH SEEP*	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Settlement Plates on top of cover to be inspected for integrity.
During Year 1, they will be surveyed quarterly, and annually thereafter

Integrity intact?
☐ Yes ☐ No

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

_____

_____

_____

* AREA OF SEEP IS OUTSIDE OF LANDFILL COVER AND EAST OF THE COVER ANCHOR TRENCH

SLOPE STABILITY

REGION	EVIDENCE OF CRACKS?	EVIDENCE OF BLOCK OR CIRCULAR FAILURE?	EVIDENCE OF SEEPS?	OTHER (DESCRIBE BELOW)
COVER SIDESLOPE – NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
COVER SIDESLOPE – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
PERIMETER CHANNEL OUTER SLOPE – NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
PERIMETER CHANNEL OUTER SLOPE – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - CENTRAL	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE – NORTH SEEP*	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

* AREA OF SEEP IS OUTSIDE OF LANDFILL COVER AND EAST OF THE COVER ANCHOR TRENCH

SOIL COVER

REGION	EVIDENCE OF SOIL DEPOSITION OR EROSION?	EVIDENCE OF EROSION RILLS/GULLIES?	EVIDENCE OF BURROWING ANIMALS?	OTHER (DESCRIBE BELOW)
TOP OF COVER – WEST	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
TOP OF COVER – EAST	☐ Yes ☐ No	☐ Yes ☐ No	☒ Yes ☐ No	
COVER SIDESLOPE – NORTH	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
COVER SIDESLOPE – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - SOUTH	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
EAST FACE SLOPE - CENTRAL	☐ Yes ☐ No	☒ Yes ☐ No	☒ Yes ☐ No	
AREA WHERE EAST SLOPE CENTRAL MEETS EAST SLOPE NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
AREA WHERE EAST SLOPE CENTRAL MEETS EAST SLOPE SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
	VENT CAPS IN PLACE & SECURE?	**STANDPIPES IN GOOD CONDITION?**	**BIRDS OR INSECTS IN VENT CAPS?**	
COVER – BAROMETRIC VENTS	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☒ No	

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

VEGETATION

REGION	CONDITION OF GRASS	UNWANTED VEGETATION PRESENT*?	OTHER (DESCRIBE BELOW)
TOP OF COVER- WEST		☐ Yes ☐ No	
TOP OF COVER - EAST		☐ Yes ☐ No	
EAST FACE SLOPE - NORTH		☐ Yes ☐ No	
EAST FACE SLOPE - SOUTH		☐ Yes ☐ No	
EAST FACE SLOPE - CENTRAL		☐ Yes ☐ No	
COVER SIDESLOPE – NORTH		☐ Yes ☐ No	
COVER SIDESLOPE – SOUTH		☐ Yes ☐ No	
VEGETATION-LINED PERIMETER CHANNEL – NORTH		☐ Yes ☐ No	
VEGETATION-LINED PERIMETER CHANNEL – SOUTH		☐ Yes ☐ No	

* Unwanted vegetation includes weeds and deep-rooting trees.

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

SEEP TREATMENT SYSTEM

REGION	EVIDENCE OF PLUGGING, OBSTRUCTIONS, OR EXCESS DEBRIS?	EVIDENCE OF CRACKS OR DETERIORATION?	OTHER (DESCRIBE BELOW)
GWIS INLET PIPES	☐ Yes ☐ No	☐ Yes ☐ No	
STRIP DRAIN INLET PIPE	☐ Yes ☐ No	☐ Yes ☐ No	
NORTH MANHOLE OUTLET PIPE	☐ Yes ☐ No	☐ Yes ☐ No	
SOUTH MANHOLE OUTLET PIPE	☐ Yes ☐ No	☐ Yes ☐ No	
TREATMENT UNIT	☐ Yes ☐ No	☐ Yes ☐ No	
TREATMENT UNIT OUTLET PIPE	☐ Yes ☐ No	☐ Yes ☐ No	
NORTH MANHOLE	☐ Yes ☐ No	☐ Yes ☐ No	
SOUTH MANHOLE	☐ Yes ☐ No	☐ Yes ☐ No	
TREATMENT UNIT GRATING	NA	☐ Yes ☐ No	

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

STORMWATER MANAGEMENT STRUCTURES

CHANNELS / LINING

STRUCTURE	EVIDENCE OF EXCESSIVE EROSION, GULLYING, SCOUR, OR UNDERMINING?	EVIDENCE OF SETTLEMENT/ SUBSIDENCE OR DEPRESSIONS?	EVIDENCE OF BREACHING OR BANK FAILURE?	EVIDENCE OF BURROWING ANIMALS?	EVIDENCE OF SEDIMENT BUILD-UP OR OTHER BLOCKAGE?	EVIDENCE OF LINING DETERIORATION, HOLES, RIPS, OR SEPARATION?	EVIDENCE OF LINING DISPLACEMENT?
DIVERSION BERM	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
VEGETATION-LINED PERIMETER CHANNEL – NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
VEGETATION-LINED PERIMETER CHANNEL – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
RIPRAP-LINED PERIMETER CHANNEL	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
C350-LINED EAST FACE	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
EAST FACE RIPRAP CHANNEL – NORTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
EAST FACE RIPRAP CHANNEL – SOUTH	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

OTHER DEFICIENCIES?

MAINTENANCE REQUIRED / COMMENTS/PHOTO LOG

STORMWATER MANAGEMENT STRUCTURES (CONTINUED)

OUTFALLS

CHECK EACH STRUCTURE FOR EXCESSIVE EROSION AND SEDIMENT DEPTH. IF SEDIMENT DEPTH IS COMPROMISING THE DESIGN CHARACTERISTICS, REMOVE SEDIMENT.

STRUCTURE	CONDITION / SEDIMENT DEPTH
DIVERSION BERM OUTFALL - NORTH	
DIVERSION BERM OUTFALL - SOUTH	
CULVERT 1 OUTFALL	
CULVERT 2 OUTFALL	
SOUTHWEST CULVERT OUTFALL	

CULVERTS

CHECK EACH STRUCTURE FOR BLOCKAGE, SURROUNDING CONDITIONS, BREACHING, SEDIMENT BUILD-UP, AND INLET/OUTLET CONDITIONS.

STRUCTURE	CONDITION
CULVERT 1	
CULVERT 2	
SOUTHWEST CULVERT	

MAINTENANCE REQUIRED/PHOTO LOG

"RUN-ON" EROSION CONTROL

AREA	ADVERSELY AFFECTING PLF?		
RUN-ON INTO PERIMETER CHANNEL – NORTH	☐ Yes	☐ No	COMMENT:
RUN-ON INTO PERIMETER CHANNEL – SOUTH	☐ Yes	☐ No	COMMENT:
NATURAL DRAINAGE FED BY CULVERT 1	☐ Yes	☐ No	COMMENT:
NATURAL DRAINAGE FED BY NORTHEAST PERIMETER CHANNEL	☐ Yes	☐ No	COMMENT:
NATURAL DRAINAGE FED BY RIPRAP	☐ Yes	☐ No	COMMENT:

MAINTENANCE REQUIRED/PHOTO LOG

INSTITUTIONAL CONTROLS

ITEM			
EVIDENCE OF EXCAVATION(S) OF COVER AND IMMEDIATE VICINITY OF COVER?	☐ Yes	☐ No	COMMENT:
EVIDENCE OF CONSTRUCTION OF ROADS, TRAILS ON COVER OR BUILDINGS?	☐ Yes	☐ No	COMMENT:
EVIDENCE OF UNAUTHORIZED ENTRY?	☐ Yes	☐ No	COMMENT:
EVIDENCE OF DRILLING OF WELLS OR USE OF GROUNDWATER?	☐ Yes	☐ No	COMMENT:
DISRUPTION OR DAMAGE OFSEEP TREATMENT SYSTEM?	☐ Yes	☐ No	COMMENT:
DAMAGE OR REMOVAL OF ANY SIGNAGE OR GROUNDWATER MONITORING WELLS?	☐ Yes	☐ No	COMMENT:

OTHER DEFICIENCIES/PHOTO LOG

ACTION ITEMS

DEFICIENCY	DATE NOTED	ACTION	DATE COMPLETED	COMMENTS

INSPECTOR SIGNATURE: _____ DATE: _____

REVIEWER SIGNATURE: _____ DATE: _____

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LEGEND

- 10 FOOT CONTOURS
- 1 FOOT CONTOURS
- ACCESS ROAD
- CULVERT
- DIVERSION BERM
- RIPRAP CHANNEL

DIVERSION BERM OUTFALL-NORTH

CULVERT 1

VEGETATION-LINED PERIMETER CHANNEL-NORTH

COVER SIDESLOPE - NORTH

EAST FACE SLOPE-NORTH

EAST FACE RIPRAP CHANNEL-NORTH

POND

EAST FACE SLOPE CENTRAL

DIVERSION BERM

SEEP TREATMENT SYSTEM

EAST FACE SLOPE-SOUTH

EAST FACE RIPRAP CHANNEL-SOUTH

CULVERT 2

RIPRAP-LINED PERIMETER CHANNEL

TOP OF COVER-WEST

TOP OF COVER-EAST

DIVERSION BERM OUTFALL-SOUTH

COVER SIDESLOPE - SOUTH

SOUTHWEST CULVERT OUTFALL

VEGETATION-LINED PERIMETER CHANNEL-SOUTH

N

100 0 100 200 FEET

EARTH TECH

PLF INSPECTIONS

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
GOLDEN, COLORADO

L\GROUP\CAD\ROCKY_FLATS\New_Design2004\PLFM&M\PLFInsp.dgn DATE: 9/21/05

APPENDIX B

GROUNDWATER WELL BORING LOGS / CONSTRUCTION SUMMARIES

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 39.4	GROUND ELEVATION (FT)	5990.00	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752688	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	JAB/KJT	70193
EAST:	2082674	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	01/15/93	

REMARKS: MOBIL DRILL B-57; HSA, CEMENT GROUT 0.0'-19.5', BENTONITE SEAL 19.5'-21.5', SAND 21.5'- 37.6', NATURAL BACK- FILL 37.6'-39.4'; CENTRALIZERS PLACED 18.5' AND 38.55'; HOLE DIAMETER 10.25" 0.0'- 37.5' AND 3.0" 37.5' - 39.4'; 2.0' SUMP 37.3'- 39.3' DEPTH TO BEDROCK 19.5'.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT) / DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%		5990 / 0			GM:	Sandy Gravel with some silt. Dark brown (7.5 YR 3/2). Coarse to fine gravel (max=2 1/2", mean=1 1/2" diam), very fine to coarse sand (mean=medium) in cloyey silt matrix. Well graded subangular to subrounded gravel and sand composed mainly of quartzite and quartz with some granite, feldspar, metamorphic frags. Not bedded, slightly moist. 65% Gravel, 20% sand, 10% silt, and 5% clay.
0.0'-1.4'				1.40 /2.00	5989 / 1				No core recovery (1.4'-2.0')
					5988 / 2			SM:	Gravelly sand with some silt and clay. Reddish brown (2.5 YR 4/4). Fine to medium gravel (max=2", mean=3/4" diam), very fine to coarse sand (mean=medium), in a silty clay matrix. Well graded. Angular to subangular gravel and sand comprised of granite, quartzite, schist, and quartz. Gravel strongly weathered and often ground to powder. Not bedded, moist. 39% Gravel, 43% sand, 13% silt, and 5% clay.
2.0'-3.5'				1.90 /2.00	5987 / 3				
3.5'-3.9'					5986 / 4			GW:	Sandy Gravel. Light olive brown (2.5 Y 5/3). Fine to coarse gravel (max=2", mean=1 1/4" diam), angular to subrounded. Very fine to coarse sand (mean=coarse), subangular to subrounded. Gravel and sand mainly composed of rock frags, weathered granite, schist, and quartzite. Not bedded, slightly moist. 45% Gravel, 46% sand, 7% silt, 2% clay.
4.0'-6.0'				2.00 /2.00	5985 / 5				No core recovery (3.9'-4.0')
								GW:	Same as above
					5984 / 6			SM:	Gravelly sand with some silt. Light olive brown (2.5 Y 5/6 to 2.5 Y 6/4). Coarse to fine gravel (max=2 1/2", mean=1" diam) and very fine to coarse (mean=coarse) sand, in cloyey silt matrix. Well graded. Angular to subrounded gravel and sand composed of quartzite, quartz, granite, schist, with some sand of feldspar and mafic minerals. Not bedded, moist. 30% Gravel, 45% sand, 16% silt, 9% clay.
6.0'-7.1'				1.10 /2.00	5983 / 7				No core recovery (7.1'-8.0')
					5982 / 8			SM:	Same as above
8.0'-8.5'								SC:	Cloyey Sand with Some silt and gravel. Light yellowish brown (2.5 Y 6/4). Coarse to fine gravel (max=2", mean=1/2" diam) and very fine to coarse sand (mean=fine) in silty cloy matrix. Well graded. Angular to subangular sand and gravel composed of quartzite, quartz, granite, and feldspar. Not bedded, moist. 21% Gravel, 39% sand, 28% cloy, and 12% silt.
8.5'-9.4'				1.60 /2.00	5981 / 9				No core recovery (9.4'-10.0')
					10				

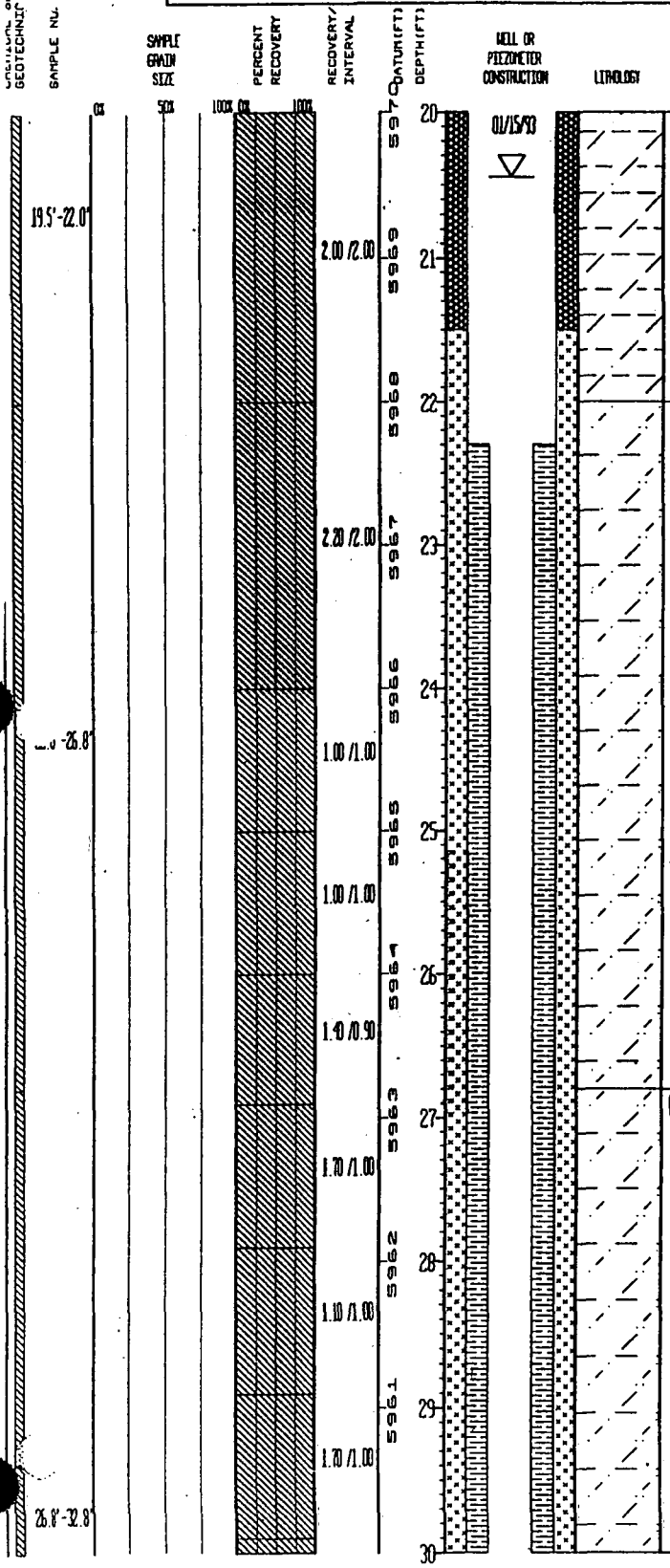
STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 39.4	GROUND ELEVATION (FT):	5990.00	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752688	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	JAB/KJT	70193
EAST:	2082674	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	01/15/93	

REMARKS: MOBIL DRILL B-57; HSA, CEMENT GROUT 0.0'-19.5', BENTONITE SEAL 19.5'-21.5', SAND 21.5'- 37.6', NATURAL BACK- FILL 37.6'-39.4'; CENTRAL-IZERS PLACED 18.5' AND 38.55'; HOLE DIAMETER 10.25" 0.0'- 37.5' AND 3.0" 37.5' - 39.4'; 2.0' SUMP 37.3'- 39.3' DEPTH TO BEDROCK 19.5'.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10				No core recovery (9.4'-10.0')
10.0'-11.3'				1.30 /2.00	5980	11			GC:	Sandy Gravel with some clay. Light yellowish brown (2.5 Y 6/4). Coarse to fine gravel (max=2 1/2", mean=1 1/4" diam) and very fine to coarse sand (mean=fine) in silty clay matrix. Well graded. Angular to rounded gravel, some broken by drilling, subangular to subrounded sand. Gravel composed of quartzite, granite, and some schist. Sand composed of quartz, rock fragments, feldspars and micas. Not bedded, moist. 44% Gravel, 39% sand, 12% clay, and 5% silt.
						12				No core recovery (11.3'-12.0')
12.0'-13.9'				1.90 /2.00	5977	13			GC:	Sandy Gravel with some clay. Strong brown (7.5 YR 5/6). Very coarse to fine gravel (max=3", mean=1" diam) and very fine to coarse sand (mean=coarse) in silty clay matrix. Well graded angular to subrounded gravel and subangular to subrounded sand. Gravel composed of quartzite, quartz, granite, schist; sand composed of quartz, feldspar, quartzite, granite, micas and mafic minerals. Moist to wet. 45% Gravel, 32% sand, 15% clay, and 8% silt
						14	01/28/93 ▽			No core recovery (13.9'-14.0')
14.0'-15.1'				1.60 /2.00	5975	15			GC:	Same as above
15.1'-15.6'									SM:	Silty Gravelly Sand. Light yellowish brown (2.5 Y 6/4) to light brown (7.5 YR 6/4). Coarse to fine gravel (max=2 1/2", mean=3/4" diam) and very fine to coarse sand (mean=coarse) in clayey silt matrix. Well graded. Angular to subrounded gravel and sand composed of quartzite, quartz, granite, and schist with some sand of feldspar, micas, mafic minerals. Not bedded, saturated. 18.5% Gravel, 55.5% sand, 20% silt, and 6% clay.
16.0'-16.5'						16				
16.5'-17.7'				1.70 /2.00	5973	17				No core recovery (15.6'-16.0')
									SM:	Same as above
									GC:	Sandy Gravel with some clay. Same as interval from 12.0' to 15.1'.
						18				No core recovery (17.7'-18.0')
18.0'-19.0'									GC:	Same as above. Saturated.
				1.60 /2.00	5971	19			SC:	Clayey Gravelly Sand. Light brownish gray (2.5 Y 6/2) to dark brown (7.5 YR 4/4). Fine gravel and very fine to coarse sand (mean=medium) composed of same composition as above. Decreasing sand and gravel with depth - transition to bedrock clay. Clay is of low plasticity. Crudely bedded at boundary with reworked bedrock. Moist. 10% Gravel, 45% sand, 35% clay, and 10% silt.
'-19.5'						20				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 39.4	GROUND ELEVATION (FT):	5990.00	PROJECT NUMBER:	999073	LOG OF BORING NUMBER:
NORTH:	752688	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST	JAB/KJT	70193
EAST:	2082674	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	01/15/93	

REMARKS: MOBIL DRILL B-57; HSA, CEMENT GROUT 0.0'-19.5', BENTONITE SEAL 19.5'-21.5', SAND 21.5'- 37.6', NATURAL BACK- FILL 37.6'-39.4'; CENTRALIZERS PLACED 18.5' AND 38.55'; HOLE DIAMETER 10.25" 0.0'- 37.5' AND 3.0" 37.5' - 39.4'; 2.0' SUMP 37.3'- 39.3' DEPTH TO BEDROCK 19.5'.



UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
SILTY CLAYSTONE	Silty Claystone with trace of very fine sand. Light olive gray (5 Y 6/2) to olive yellow (2.5 Y 6/8) where stained by Fe-oxides, moderately sorted, porosity=18%, no cement, moderately to highly friable, massive claystone with mottled coloring due to weathering, increasing silt content with depth. Moist. 20% Silt and 80% clay.
CLAYEY SILTSTONE	Clayey Siltstone with some very fine sand. Gray (5 Y 6/1) to light yellowish brown (2.5 Y 6/4) and olive yellow (2.5 Y 6/8), moderately sorted, porosity=20%-25%, no cement, highly to moderately friable, composed of varying proportions of clay and silt, siltstone often contains up to 10% of very fine sand, mottled coloring due to weathering, thin and irregular subparallel bedding to disturbed bedding, not fractured, moist to wet. 5% Sand, 65% silt, and 30% clay.
CLAYEY SILTSTONE	Clayey Siltstone. Light olive brown (2.5 Y 5/6) to olive yellow (2.5 Y 6/8), variable porosity 10%-25%, no cement, highly friable, silt and clay vary throughout interval but bedding is not apparent, much of core heavily damaged during drilling, mottled due to Fe-oxide staining, weathered not fractured (except where damaged), moist to wet (saturated) bottom 0.5" of interval stained bright olive yellow (Fe-hydroxide stain). Carbonaceous fragments present, especially from 30.0'-31.0'. 60% Silt and 40% clay.

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 39.4	GROUND ELEVATION (FT):	5990.00	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752688	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	JAB/KJT	70193
EAST:	2082674	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	01/15/93	

REMARKS: MOBIL DRILL B-57; HSA, CEMENT GROUT 0.0'-19.5', BENTONITE SEAL 19.5'-21.5', SAND 21.5'- 37.6', NATURAL BACK- FILL 37.6'-39.4'; CENTRALIZERS PLACED 18.5' AND 38.55'; HOLE DIAMETER 10.25" 0.0'- 37.5' AND 3.0" 37.5' - 39.4'; 2.0" SUMP 37.3'- 39.3' DEPTH TO BEDROCK 19.5'

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NO.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		CH 50%	100% CR 100%	2.20 /1.10	5960	30			CLAYEY SILTSTONE	Clayey Siltstone. Light olive brown (2.5 Y 5/6) to olive yellow (2.5 Y 6/8), variable porosity 10%-25%, no cement, highly friable, silt and clay vary throughout interval but bedding is not apparent, much of core heavily damaged during drilling, mottled due to Fe-oxide staining, weathered not fractured (except where damaged), moist to wet (saturated) bottom 0.5" of interval stained bright olive yellow (Fe-hydroxide stain). Carbonaceous fragments present, especially from 30.0'-31.0'. 60% Silt and 40% clay.
				2.00 /1.00	5959	31				
				2.00 /1.00	5958	32				
				2.00 /1.00	5957	33			SILTSTONE	Siltstone with some clay. Light olive brown (2.5 Y 5/4) to olive yellow (2.5 Y 6/8), porosity = 20%-25%, no cement, highly to moderately friable, clay content varies, sub-horizontal bedding occurs in siltiest intervals, not fractured but damaged during drilling, moist. 85% Silt and 15% clay.
				2.00 /1.00	5956	34				
-35.5'				1.80 /1.00	5955	35				
35.5'-35.8'				1.40 /1.00	5954	36			SILTY CLAYSTONE	Silty Claystone. Dark grayish brown (2.5 Y 4/2), porosity = 10%-15%, no cement, slightly to moderately friable, grades into overlying siltstone, not bedded, not fractured but broken during drilling, slightly moist. 70% Clay and 30% sand.
35.8'-36.5'				1.80 /1.00	5953	37			SILTY SANDSTONE	Silty Sandstone. Light gray (5 Y 6/1) to olive yellow (2.5 Y 6/6), very fine sand, moderately sorted, porosity = 25%, no cement, highly friable, intermixed with claystone and siltstone but not bedded. 70% Sand, 25% silt, and 5% clay.
36.5'-37.8'				1.20 /1.00	5952	38			CLAYEY SILTSTONE	Clayey Siltstone. Dark gray (5 Y 4/1) to dark grayish brown (2.5 Y 4/2), porosity varies from 10% to 25%, no cement, slightly to moderately friable, Fe-oxide stains present but limited, thin irregular planar bedding. 60% Silt and 40% clay.
37.8'-39.4'				0.45 /0.40	5951	39			SILTSTONE	Siltstone with some clay. Light olive brown (2.5 Y 5/4) to gray (5 Y 5/1), porosity-20%-25%, no cement, moderately friable, clay content varies (max-25%) in thin 1" intervals within siltstone, irregular bedding, subhorizontal, not fractured, moist. 85% Silt and 15% clay. Total Depth 39.4'.
				1.10 /1.00		40				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 26.00	GROUND ELEVATION (FT):	5997.90	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752090	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	J. BOTLAN	70393
EAST:	2082389	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	7	DATE DRILLED:	02/02/93	

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.25', BENTONITE SEAL 4.25'-6.5', SAND 6.5'-24.5', NATURAL BACKFILL 24.5'-26'; CENTRALIZERS PLACED AT 3.8' AND 24.2'; 2' SUMP 22.8'-24.8'; DEPTH TO BEDROCK 22.8'.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NO.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0.0'-.7'		0% 50%	100% 0%	0.70 /2.00	5997	0			SC:	Gravelly Sand with silt and clay. Very dark grayish brown (10 YR 3/2). Coarse to fine sand (mean=Fine) with coarse to fine gravel (max=3", mean=0.5" diam). Sand subangular to sub-rounded comprised of quartz, trace of dark minerals. Gravel subangular to subrounded, comprised of quartzite and igneous rock frags. Not bedded, well graded. Slightly moist. 15% Gravel, 67% sand, 7% clay, and 7% silt.
						1				No core recovery (0.7'-2.0').
2.0'-2.9'				0.90 /2.00	5995	2			SC:	Gravelly Clayey Sand. Grayish brown (2.5 Y 5/2), dark grayish brown (2.5 Y 4/3) and dark reddish gray (2.5 YR 4/6) staining. Coarse to fine sand (mean=Fine) with coarse to fine gravel. Sand subangular to subrounded, comprised of quartz and a trace of dark minerals and rock frags. Gravel subangular to subrounded, comprised of igneous rock frags and quartzite. Not bedded, poorly sorted. Slightly moist. 15% Gravel, 63% sand, 14% clay, and 8% silt.
						3				No core recovery (2.9'-4.0').
4'-6.0'				2.00 /2.00	5993	4			SM:	Gravelly Sand. Light olive brown (5 Y 5/3) to olive brown (5 Y 5/3), becoming dark yellowish brown (10 YR 4/6) at base. Sand coarse to fine (mean=Fine). Gravel coarse to fine (max=3", mean=1" diam). Sand subangular to subrounded, comprised of quartz with a trace of dark minerals and rock frags. Gravel subangular to subrounded comprised of quartzite and igneous rock frags. Not bedded, poorly sorted. Slightly moist. 32% Gravel, 50% sand, 7% clay, and 11% silt.
					5992	5				
6.0'-7.1'				1.10 /2.00	5991	6			GC:	Sandy Gravel. Dark yellowish brown (10 YR 4/4) with very dark gray (2.5 YR N3) cobbles. Coarse to fine gravel (max=3", mean=2" diam), fractured; subangular to subrounded; comprised of igneous frags with some smaller granite and quartzite frags. Sand coarse to fine; subangular to subrounded; comprised of quartz, trace of dark minerals, and rock frags. Fines upward, possibly two graded (fining up) sequences. Slightly moist. 50% Gravel, 35% sand, and 15% fines.
					5990	7				No core recovery (7.1'-8.0').
8.0'-8.8'				0.80 /2.00	5989	8			GC:	Same as above. See description 6.0'-7.1'.
					5988	9				No core recovery (8.8'-10.0').
						10				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 26.00	GROUND ELEVATION (FT):	5997.90	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752090	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	J. BOYLAN	70393
EAST:	2082389	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	7	DATE DRILLED:	02/02/93	

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.25', BENTONITE SEAL 4.25'-6.5', SAND 6.5'-24.5', NATURAL BACKFILL 24.5'-26'; CENTRALIZERS PLACED AT 3.8' AND 24.2'; 2' SUMP 22.8'-24.8'; DEPTH TO BEDROCK 22.8'.

CHEMICAL SAMPLE DEPTH / GEOTECHNICAL SAMPLE DEPTH	SAMPLE NUMBER	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50% 100%	0% 100%							
10.0'-11.1'				1.40 /2.00	5985	10			SM:	Gravelly Sand. Dark yellowish brown (10 YR 4/4) to olive gray (5 Y 5/2) with reddish brown (5 YR 4/4) staining. Fine to coarse sand (mean=fine) and coarse to fine gravel (max=2", mean=0.5" diam). Sand subangular to subrounded, comprised of quartz with a trace of mica and dark minerals. Gravel sub-angular to subrounded, comprised of igneous rock frags and pegmatitic quartzite. No bedding. Slightly moist. 30% Gravel, 50% sand, and 20% fines.
11.1'-11.4'						11				
12.0'-12.9'				1.80 /2.00	5985	12			SC:	Sand with some gravel and clay. Light olive brown (5 Y 5/4) to brown (10 YR 5/3). Coarse to fine (mean=fine) sand and coarse to fine gravel (max=2", mean=0.5" diam). Sand subangular to subrounded, comprised of quartz with a trace of mica and dark minerals. Gravel subangular to subrounded, comprised of granitic, mafic, igneous, arkosic, and quartzite rock frags. No bedding. Slightly moist. 14% Gravel, 71% sand, and 10% clay, and 5% silt.
12.9'-13.8'						13				
							02/22/93			No core recovery (11.4'-12.0').
							02/26/93		SC:	Same as above. See description 11.0'-11.4'.
-14.6'				0.60 /2.00	5985	14			CL:	Sandy Clay with some gravel and silt. Mottled dark yellowish brown (10 YR 4/6) and light olive gray (5 Y 6/2). Coarse to fine gravel (max=2.5", mean=0.5" diam) and coarse to fine (mean=medium) sand. Gravel and sand angular to subrounded, comprised mainly of quartzite and schist. Low to moderate plasticity. Moderately well graded. No bedding. Slightly moist. 15% Gravel, 35% sand, 35% clay, and 15% silt.
										No core recovery (13.8'-14.0').
16.0'-16.4'				0.40 /2.00	5985	16			SC:	Gravel, sand, clay mixture. Strong brown (7.5 YR 5/6) to yellowish brown (10 YR 5/4). Gravels broken during drilling (3" diam) and very coarse to very fine sand (mean=medium). Sand angular to subrounded. Poorly to moderately graded. Igneous and metamorphic gravels, sand is predominantly quartz. No bedding. Slightly moist. 20% Gravel, 50% sand, and 30% fines.
										No core recovery (14.6'-16.0').
									SC:	Same as above See description 14.0'-14.6'.
										No core recovery (16.4'-18.0').
18.0'-18.3'						18			SC:	Same as above See description 14.0'-14.6'.
18.3'-20.0'				2.00 /2.00	5985	19			SC:	Sand with gravel and clay. Light yellowish brown (2.5 Y 6/3) dominates to 20.0'. Fine to coarse gravel (max=2", mean= .25"-.5") and very fine to very coarse sand (mean=fine to medium) Grains subangular to subrounded, comprised of quartz and quartzitic metamorphic rock frags with abundant Fe-oxide grains below 20.0'. Moderately well graded, no bedding. Coarser below 21.0'. Slightly moist. 7% Gravel, 82% sand, 4% silt, and 7% clay.
						20				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 26.00	GROUND ELEVATION (FT):	5997.90	PROJECT NUMBER:	389073
NORTH:	752090	AREA: 007 PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	J. BOTLAN
EAST:	2082389	LOCATOR NUMBER: 12J	BOREHOLE DIAMETER (IN):	7	DATE DRILLED:	02/02/93

LOG OF BORING NUMBER: 70393

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.25', BENTONITE SEAL 4.25'-6.5', SAND 6.5'-24.5', NATURAL BACKFILL 24.5'-26'; CENTRALIZERS PLACED AT 3.8' AND 24.2'; 2' SUMP 22.8'-24.8'; DEPTH TO BEDROCK 22.8'.

CHEMICAL SAMPLE DEPTH
GEOTECHN SAMPLE DEPTH
SAMPLE NUMBER

20.0'-22.8'

...1'-26.0'

SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
CR SOIL	100% CR 100%	1.30 /2.00	5985	20			SC:	Same as above. See description 18.3'-20.0', with a color change to strong brown (7.5 YR 5/6, 4/6) to reddish yellow (7.5 YR 6/6). Coarsens below 21.0'.
			5980	21				
			5975	22				
		0.90 /2.00	5970	23			CLAYSTONE:	Claystone. Top of bedrock 22.8'. See description below
			5965	24				No core recovery (22.9'-24.0').
		2.40 /2.00	5960	25			CLAYSTONE:	Claystone. Light brownish gray (2.5 Y 6/2) above 25.0' to light olive brown (2.5 Y 5/3), yellowish brown (10 YR 5/6, 5/8) and dark yellowish brown (10 YR 4/6, 3/6). Core is thin, extruded due to gravel clast pushed by auger. Trace to some silt. Porosity=5%-10%. Argillaceous cement plus Fe-oxide in yellowed areas. Non- to slightly- friable. No apparent bedding. Slightly moist. 95% Clay and 5% silt. Total Depth 26.0'.
			5955	26				
			5950	27				
			5945	28				
			5940	29				
			5935	30				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 30.3	GROUND ELEVATION (FT):	5991.20	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752070	AREA: OUT PRESENT LANDFILL	CASING DIAMETER (IN):	2	GEOLOGIST:	JAB/KJT	70693
EAST:	2082799	LOCATOR NUMBER: LIJ	BOREHOLE DIAMETER (IN)	10.25	DATE DRILLED:	12/04/92	

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.2', BENTONITE SEAL 4.2'-6.5', SAND 6.5'-30.5', NO BACKFILL. NO CENTRALIZERS PLACED; BOREHOLE DIAMETER 10.25" 0'-28.5' AND 3" 28.5'-30', 2.1' SUMP 28.4'-30.5'; DEPTH TO BEDROCK 28.5'

CHEMICAL SAMPLE DEPTH / GEOTECHN SAMPLE DEPTH	SAMPLE NUMBER	GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
		0% 50%	100% 0% 100%		5991	0			GC:	Clayey Gravel with some Silt and Sand. Dark brown (7.5 YR 3/2) well graded coarse to fine gravel (max=1.5" diam) and fine to coarse sand in silty clay matrix. Subangular to angular sand and gravel composed of quartz and feldspar frags. Moist 70% Gravel, 10% clay, 10% sand, and 5% silt
0.0'-1.0'										
1.0'-1.1'				1.10 /2.20	5990	1			GC:	See description below. Same as 2.2'-2.8'
										No core recovery (1.1'-2.2')
2.2'-2.8'					5989	2			GC:	Sandy Clayey Gravel. Dark red (2.5 YR 3/6) well graded fine to coarse gravel and sand in silty clay matrix. Subangular sand and gravel, slightly moist. 45% Gravel, 30% sand, 25% clay, and 5% silt
2.8'-4.8'				2.00 /2.00	5988	3			SC:	Gravelly Clayey Sand with some silt. Dark brown (7.5 YR 4/4) fine to coarse gravel (max=3" diam) and fine to coarse sand in silty clay matrix. Well graded, angular to subangular gravel composed of weathered rock frags (igneous and metamorphic), quartz, and feldspar. Sand composed of quartz and feldspar. Gravel and sand strongly weathered with some secondary clay. Slightly moist. 30% Gravel, 35% sand, 20% clay, and 15% silt
					5987	4				
				0.60 /2.00	5986	5				No core recovery (4.8'-6.2')
6.2'-6.9'					5985	6			SM:	Sandy Gravel with some silt. Light olive brown (2.5 Y 5/6) to black (N2). Poorly graded medium to fine gravel in fine to coarse sand and silt matrix with a trace of clay. Gravel and sand subangular to subrounded. Matrix contains tarry substance (creosote?). Moist. 40% Gravel, 50% sand, 8% silt, and 2% clay
				2.00 /2.00	5984	7				
6.9'-8.8'					5983	8			SC:	Gravelly Sand with trace of clay. Brown (7.5 YR 5/4) to strong brown (7.5 YR 5/6). Well graded, coarse to fine gravel (max=2" diam) and sand (mean=coarse) in silty clay matrix. Angular to subangular gravel (broken) and subangular sand. Gravel composed of rock frags and quartz. Sand composed of rock frags, quartz, feldspar, and micas. Moist. 27% Gravel, 65% sand, 5% clay, and 3% silt
				0.60 /2.00	5982	9				No core recovery (8.8'-10.2')
						10				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 30.3		GROUND ELEVATION (FT)	5991.20	PROJECT NUMBER:	989073
NORTH:	752070	AREA: OU7 PRESENT LANDFILL		CASING DIAMETER (IN)	2	GEOLOGIST:	JAB/KJT
EAST:	2082799	LOCATOR NUMBER:	11J	BOREHOLE DIAMETER (IN)	10.25	DATE DRILLED:	12/04/92

LOG OF BORING NUMBER: 70693

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.2', BENTONITE SEAL 4.2'-6.5', SAND 6.5'-30.5', NO BACKFILL; NO CENTRALIZERS PLACED; BOREHOLE DIAMETER 10.25" 0'-28.5' AND 3" 28.5'-30', 2.1' SUMP 28.4'- 30.5'; DEPTH TO BEDROCK 28.5'

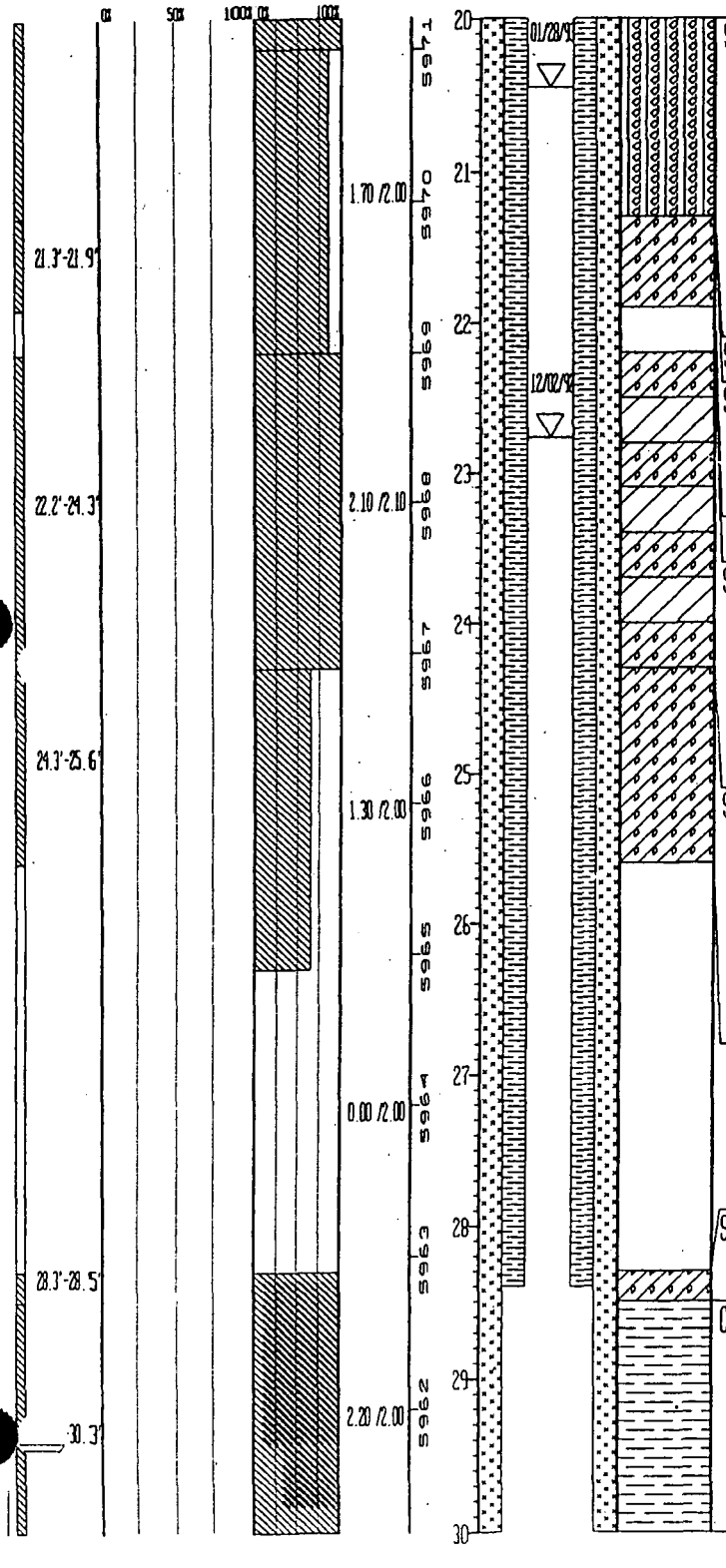
GEOTECHNICAL SAMPLE NO.	SAMPLE NO.	SAMPLE DEPTH	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT) DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
						10				No core recovery (10.8'-10.2')
						11			SC:	Same as above
		10.2'-12.6'			2.00 /2.00	12				
						13			ML:	Sandy Silt with some clay Reddish yellow (7.5 YR 6/8) Very fine to fine sand in clayey silt matrix. Low plasticity Poorly graded. Subangular to subrounded sand, composed of quartz, micas - including biotite, rock frags, trace of black stained material throughout (not identified) Moist 50% Silt, 30% sand, and 15% clay
		12.6'-14.3'			2.00 /2.00	14				
		14.3'-15.4'			1.10 /2.00	15			SC:	Gravelly Sand. Reddish yellow (7.5 YR 6/6) fine to medium gravel and very fine to coarse sand (mean=coarse) in clay and silt matrix. Well graded. Subangular to angular sand and gravel composed of rock frags and quartz. Moist 23% Gravel, 56% sand, 11% clay, and 10% silt.
						16				No core recovery (15.4'-16.2')
		16.2'-16.5'							SC:	Same as above.
		16.5'-17.6'			2.00 /2.00	17			SC	Clayey Sand with some silt Light brownish gray (2.5 Y 6/2) to reddish yellow (7.5 YR 6/8)" Very fine to fine sand in silty clay matrix. Subangular to subrounded sand composed of quartz, micas, rock frags, and feldspar Moist 50% Sand, 40% clay, and 10% silt
						18			SM:	Silty Sand with some gravel and trace of clay Light brownish gray (2.5 Y 6/2) to reddish yellow (7.5 Y 6/8) Heterogeneous mix of gravelly clayey sand, silty sand, and clayey silty sand. Gravel concentrated between 18.0'-18.5' (damaged core) Fine to medium gravel (max=0.5" diam) and very fine to fine sand in silty clay matrix Well graded, sub-angular to subrounded gravel and sand composed of rock frags and quartz with some feldspar, micas, and clays Moist to wet Grades into underlying clay 7% Gravel, 50% Sand, 30% silt, and 13% clay
					2.00 /2.00	19				
		21.3'				20				

STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 30.3		GROUND ELEVATION (FT)	5991.20	PROJECT NUMBER:	989073
NORTH:	752070	AREA: 807 PRESENT LANDFILL		CASING DIAMETER (IN):	2	GEOLOGIST:	JAB/KJT
EAST:	2082799	LOCATOR NUMBER: LIJ		BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	12/04/92

LOG OF BORING NUMBER: 70693

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.2', BENTONITE SEAL 4.2'-6.5', SAND 6.5'-30.5', NO BACKFILL, NO CENTRALIZERS PLACED; BOREHOLE DIAMETER 10.25" 0'-28.5' AND 3" 28.5'-30', 2.1' SUMP 28.4'-30.5', DEPTH TO BEDROCK 28.5'

GEOTECHNICAL SAMPLE DEPTH	SAMPLE NO.	SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM(FT)	DEPTH(FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
									SM:	Silty Sand with some gravel and trace of clay. Light brownish gray (2.5 Y 6/2) to reddish yellow (7.5 Y 6/8) Heterogeneous mix of gravelly clayey sand, silty sand, and clayey silty sand. Gravel concentrated between 18.0'-18.5' (damaged core) Fine to medium gravel (max=0.5" diam) and very fine to fine sand in silty clay matrix. Well graded, sub-angular to subrounded gravel and sand composed of rock frags and quartz with some feldspar, micas, and clays. Moist to wet. Grades into underlying clay. 7% Gravel, 50% Sand, 30% silt, and 13% clay
									SM:	Same as above
									SC:	Clayey Sand with some gravel Strong brown (7.5 Y 5/8) Fine gravel and fine to coarse sand in silty clay matrix. Sub-rounded sand and gravel Moist to wet 5% Gravel, 60% sand, 20% clay, and 15% silt.
										No core recovery (21.9'-22.2')
									SC	Clayey Sand to Sandy Clay. Light olive brown (2.5 Y 5/3) to light brownish gray (2.5 Y 6/2) Interbedded sand and clay layers (thick) Very fine to medium sand in clay and silt matrix. Subangular to subrounded sand composed of quartz, felspar, micas, rock frags, and trace of carbonaceous material Some Fe-oxide stains within clay and sand. Wet 50% Sand, 38% clay, and 12% silt, to 72% clay, 10% silt, and 18% sand.
									SC	Gravelly Silty Sand. Strong brown (7.5 Y 5/6) Coarse to fine gravel (max=1 3/4" diam) and fine to coarse sand in clayey silt matrix. Subangular gravel but angular where broken with angular to subrounded sand Well graded. Gravel composed mainly of quartz, quartzite, and rock frags with some meta-morphic rocks. Sand composed of quartz, rock frags, mafic minerals, and feldspar Wet/saturated. 25% Gravel, 59% sand, 10% silt, and 6% clay
										No core recovery (25.6'-28.3')
									SC	Same as above Top of bedrock 28.5'
									CLAYSTONE	Claystone with trace of silt Grayish brown (2.5 Y 5/2) to light olive brown (2.5 Y 5/6) Clay with trace of silt (1%) Well sorted, porosity=10%, no cement, slightly friable, slightly weathered, mottled gray appearance with some irregular patches of Fe-oxide stains, massive, not fractured Moist 96% Clay and 4% silt



STATE PLANE COORDINATE:		TOTAL DEPTH (FT): 30.3	GROUND ELEVATION (FT)	5991.20	PROJECT NUMBER:	989073	LOG OF BORING NUMBER:
NORTH:	752070	AREA: OUT PRESENT LANDFILL	CASING DIAMETER (IN)	2	GEOLOGIST	JAB/KJT	70693
EAST:	2082799	LOCATOR NUMBER: LIJ	BOREHOLE DIAMETER (IN):	10.25	DATE DRILLED:	12/04/92	

REMARKS: MOBIL DRILL B-57; HSA; CEMENT GROUT 0.0'-4.2', BENTONITE SEAL 4.2'-6.5', SAND 6.5'-30.5', NO BACKFILL; NO CENTRALIZERS PLACED; BOREHOLE DIAMETER 10.25" 0'-28.5' AND 3" 28.5'-30', 2.1' SUMP 28.4'- 30.5'; DEPTH TO BEDROCK 28.5'

GEOTECHNICAL SAMPLE DEPTH

SAMPLE NO.

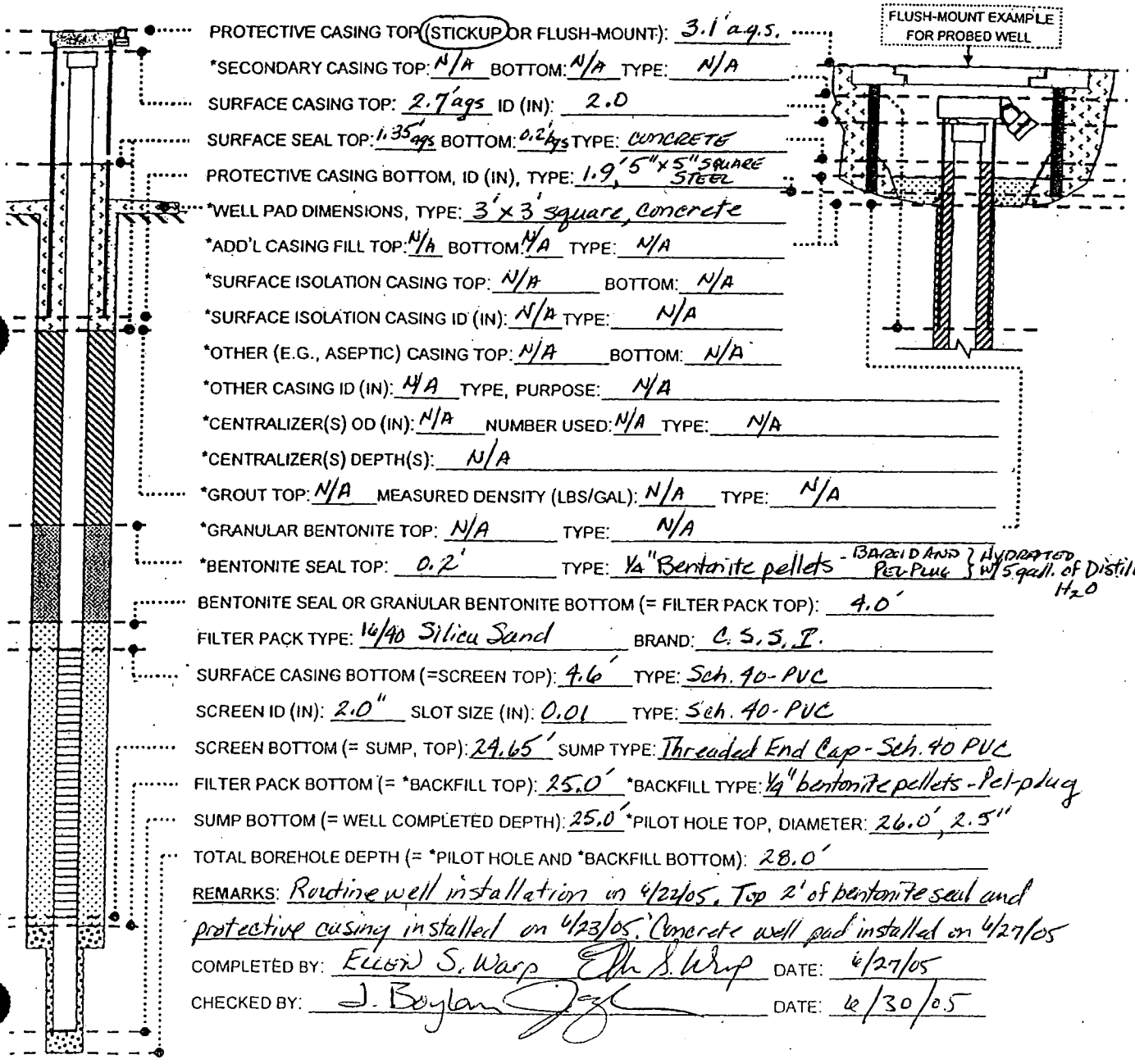
SAMPLE GRAIN SIZE	PERCENT RECOVERY	RECOVERY/ INTERVAL	DATUM (FT)	DEPTH (FT)	WELL OR PIEZOMETER CONSTRUCTION	LITHOLOGY	UNIFIED SOILS CLASSIFICATION OR ROCK TYPE	DESCRIPTION
0% 50%	100% 0% 100%		5961	30			CLAYSTONE	Same as above. Total Depth 30.3'
			5960	31				
			5959	32				
			5958	33				
			5957	34				
			5956	35				
			5955	36				
			5954	37				
			5953	38				
			5952	39				
				40				

MONITORING WELL INSTALLATION REPORT: Form PRO.118

LOCATION CODE: 73005 PROJECT NAME: CY05 Well Installation PROGRAM: Present Landfill
SCREENED FORMATION: Bdrk. DRILLING CONTRACTOR: Layne BORING METHOD: Hollow Stem Auger
DATE DRILLED: 6/22/05 DATE COMPLETED: 6/27/05 TOTAL DEPTH: 28.0' COMPLETED DEPTH: 25.0'
ESTIMATED DEPTH TO BEDROCK: 0.0' RIG GEOLOGIST: E. Warp LOGGING GEOLOGIST: E. Warp
BOREHOLE DIAMETER IN SCREENED INTERVAL: 8" QUANTITY OF FLUIDS LOST DURING DRILLING: N/A
INITIAL WATER LEVEL (FT, DATE): Dry, 6/22/05 COMPLETED WATER LEVEL (FT, DATE): Dry, 6/27/05
DIAMETER & TYPE OF INSTALLATION (WELL/PIEZOMETER/WELL POINT/ETC.): 2" PVC Well
TYPE OF PROTECTION (FLUSH-MOUNT VS. ABOVE GROUND, ASEPTIC, ETC.): Above Ground Steel Protective Casing

ALL MEASUREMENTS WILL BE MADE IN FEET FROM GROUND SURFACE

* DENOTES ITEMS THAT MAY NOT BE APPLICABLE, DEPENDING ON BORING METHOD, WELL PROTECTION & PURPOSE



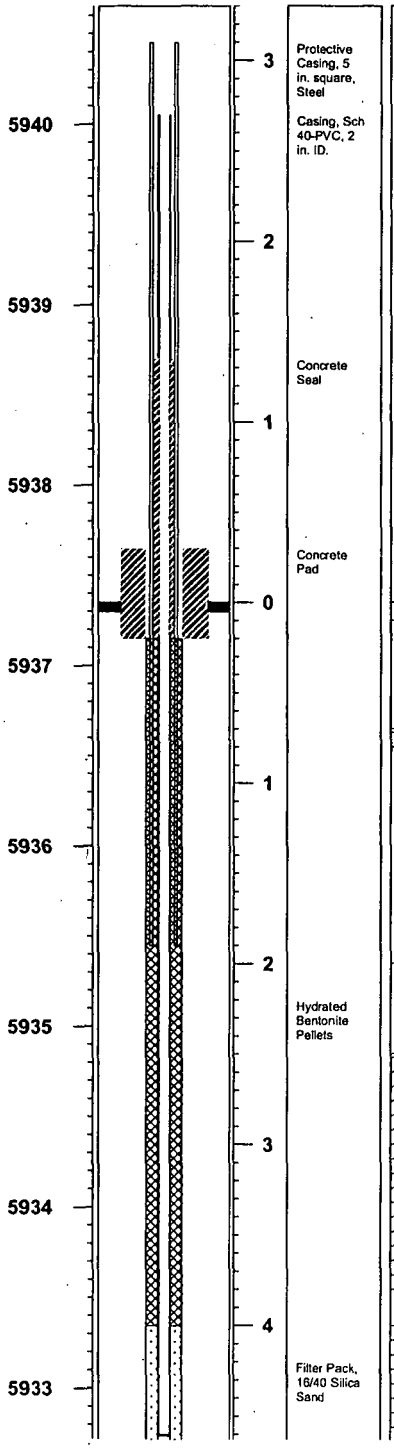
PROTECTIVE CASING TOP (STICKUP OR FLUSH-MOUNT): 3.1' a.g.s.
*SECONDARY CASING TOP: N/A BOTTOM: N/A TYPE: N/A
SURFACE CASING TOP: 2.7' ags ID (IN): 2.0
SURFACE SEAL TOP: 1.35' ags BOTTOM: 0.2' ags TYPE: Concrete
PROTECTIVE CASING BOTTOM, ID (IN), TYPE: 1.9', 5"x5" Square Steel
*WELL PAD DIMENSIONS, TYPE: 3'x3' square, concrete
*ADD'L CASING FILL TOP: N/A BOTTOM: N/A TYPE: N/A
*SURFACE ISOLATION CASING TOP: N/A BOTTOM: N/A
*SURFACE ISOLATION CASING ID (IN): N/A TYPE: N/A
*OTHER (E.G., ASEPTIC) CASING TOP: N/A BOTTOM: N/A
*OTHER CASING ID (IN): N/A TYPE, PURPOSE: N/A
*CENTRALIZER(S) OD (IN): N/A NUMBER USED: N/A TYPE: N/A
*CENTRALIZER(S) DEPTH(S): N/A
*GROUT TOP: N/A MEASURED DENSITY (LBS/GAL): N/A TYPE: N/A
*GRANULAR BENTONITE TOP: N/A TYPE: N/A
*BENTONITE SEAL TOP: 0.2' TYPE: 1/4" Bentonite pellets - Baroid and Pel-Plug } Hydrated w/ 5 gall. of Distilled H_2O
BENTONITE SEAL OR GRANULAR BENTONITE BOTTOM (= FILTER PACK TOP): 4.0'
FILTER PACK TYPE: 16/40 Silica Sand BRAND: C.S.S.I.
SURFACE CASING BOTTOM (=SCREEN TOP): 4.6' TYPE: Sch. 40-PVC
SCREEN ID (IN): 2.0" SLOT SIZE (IN): 0.01 TYPE: Sch. 40-PVC
SCREEN BOTTOM (= SUMP, TOP): 24.65' SUMP TYPE: Threaded End Cap - Sch. 40 PVC
FILTER PACK BOTTOM (= *BACKFILL TOP): 25.0' *BACKFILL TYPE: 1/4" bentonite pellets - Pel-plug
SUMP BOTTOM (= WELL COMPLETED DEPTH): 25.0' *PILOT HOLE TOP, DIAMETER: 26.0', 2.5"
TOTAL BOREHOLE DEPTH (= *PILOT HOLE AND *BACKFILL BOTTOM): 28.0'

REMARKS: Routine well installation on 6/22/05. Top 2' of bentonite seal and protective casing installed on 6/23/05. Concrete well pad installed on 6/27/05

COMPLETED BY: Elton S. Warp Elton S. Warp DATE: 6/27/05
CHECKED BY: J. Boylan DATE: 6/30/05

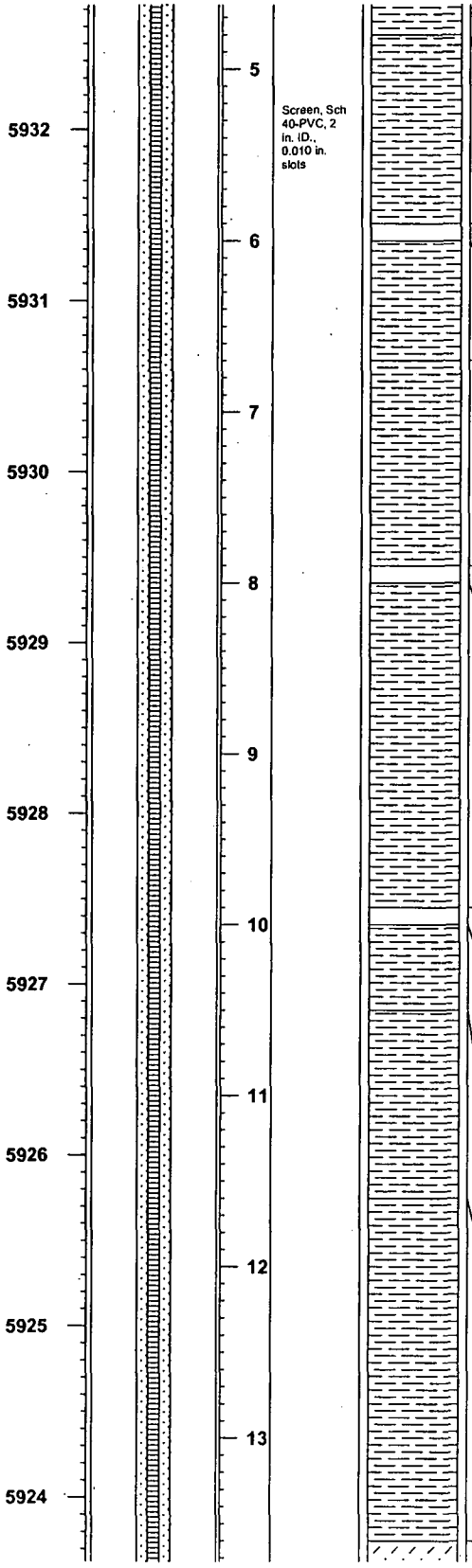
STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5937.35	CASING DIA (IN): 2
NORTH: 753006.65	TOTAL DEPTH (FT): 28.0	BH DIA. (IN): 8
EAST: 2084095.22	COMPLETION DATE: 6/22/05	GRID LOCATOR:
PROJECT: Present Landfill	GEOLOGIST: E. Warp	
REMARKS:		

LOG OF BORING NUMBER: 73005



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		SILTSTONE: Clayey Siltstone, light yellowish brown (10YR6/4). Massive texture, trace roots, dry.
		SILTSTONE: Clayey Siltstone with trace to some sand in pockets (rip-up?), brownish yellow (10YR6/6) with some light gray (10YR7/1) mottling. Weak to moderate pervasive iron oxidation with some un-oxidized mottling. Massive texture. Weak to moderately friable, trace roots. Slightly moist. Trace to some, very fine grained, sand.
		CLAYSTONE: Silty Claystone, light brownish gray (10YR6/2). Decreased iron oxidation to trace. Strongly friable, crumbly, trace roots, slightly moist.
		No recovery.
		SILTSTONE: Clayey Siltstone, light yellowish brown (10YR6/4) to light brownish gray (10YR6/2). Weak pervasive iron oxidation from 2.0' to 2.1'. Massive texture, slightly moist. Increasing clay at base of interval. Moderately friable.
		CLAYSTONE: Claystone with some silt, light brownish gray (10YR6/2). Trace weak iron oxidation, predominately along bedding planes (subhorizontal) and fracture surfaces. Trace white caliche stringers and blebs. Massive texture, moderately friable, slightly moist.
		No recovery.
		CLAYSTONE: Claystone with some silt, pale brown (10YR6/3) with some gray (10YR5/1) mottling. Weak pervasive iron oxidation from

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73005 Lithologic Description	Page 2 of 4



4.0' to 4.4'. Gray mottling from 4.4' to 4.8', with iron oxidation on internal fracture surfaces. Massive texture. Slightly moist from 4.0' to 4.4', increase to moist from 4.4' to 4.8'. Friable.

CLAYSTONE: Claystone with some silt, gray (10YR5/1) to grayish brown (10YR5/2). Weak iron oxidation along bedding planes. Massive texture, weak to moderately friable, slightly moist.

No recovery.

CLAYSTONE: Claystone with trace silt, same as interval from 4.8' to 5.9'. Slightly moist.

CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable. Slightly moist.

No recovery.

CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable, slightly moist.

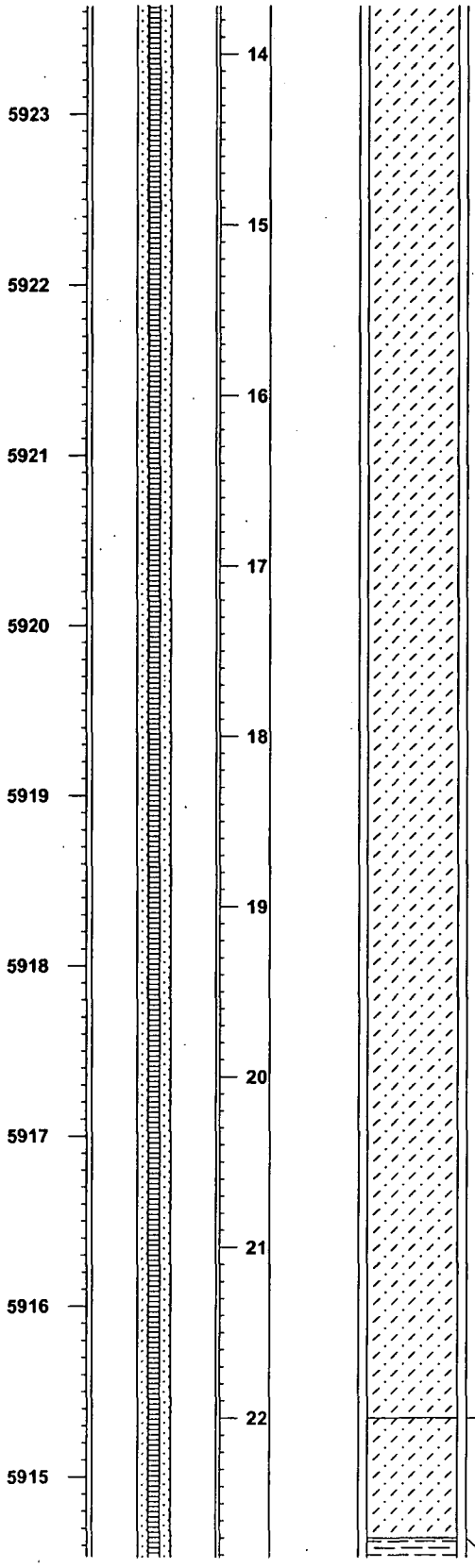
No recovery.

CLAYSTONE: Claystone, gray (10YR6/1), predominately un-oxidized. Faint undulating bedding planes visible. Trace black organic stringers throughout. Weak to moderately friable, slightly moist. Trace iron oxidation stringers from 10.3' - 10.5'.

CLAYSTONE: Claystone, brown (10YR5/3), slight color change. Faint laminations (bedding planes) visible with trace to some black organic stringers on planes. Trace to some iron oxidation stringers along bedding planes and fracture surfaces. Weak to moderately friable, slightly moist.

CLAYSTONE: Claystone, gray (10YR5/1 to 10YR6/1). Weak iron oxidation along bedding planes at 11.6' and from 12.2' to 13.0'. Fissile and moderately friable, slightly moist. Iron oxidation along fracture surfaces, especially from 11.6' to 11.8' and 12.2' to 13.0'.

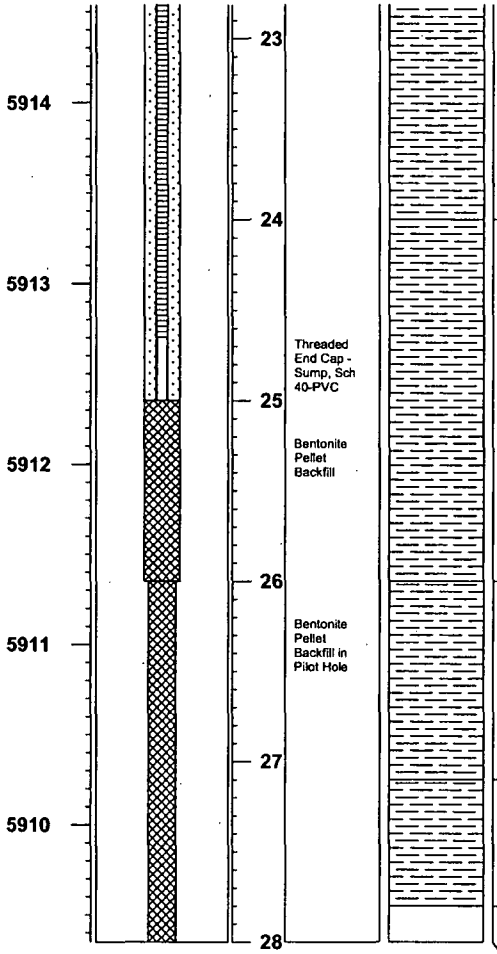
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73005 Lithologic Description	Page 3 of 4



SILTSTONE: Clayey Siltstone to silty claystone, pale brown (10YR6/3) to light brownish gray (10YR6/2). Weak iron oxidation on sub-horizontal bedding planes (approximately 4 to 6 iron-oxidized bedding planes per foot) and fracture surfaces. Trace black organic stringers. Notable iron oxidation coating 80 deg fracture from 18.9' to 19.2'. Color of iron oxidation is strong brown (7.5YR5/6). Iron oxidation on 20 deg fracture from 19.5' to 19.6'. Moisture decreasing to trace. Occasional iron oxidation-replaced organic debris fragments. Some intervals to silty claystone, but predominately clayey siltstone.

SILTSTONE: Clayey Siltstone to silty claystone, gray (10YR5/1). Notable color change. Decrease iron oxidation to trace as minor fracture coating. Massive texture, moderately friable. Increase moisture to slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73005 Lithologic Description	Page 4 of 4



CLAYSTONE: Claystone with some silt, yellowish brown (10YR5/6) and gray (10YR5/1). Weak iron oxidation mottled throughout. Iron oxide coating ~80 deg fracture at 22.9'. Moderate pervasive iron oxidation from 23.7' to 23.8'. Moderately friable from 23.1' to 24.0', corresponding with increased moisture zone. Slightly moist from 22.7' to 23.1', moist from 23.1' to 24.0'.

CLAYSTONE: Claystone with trace silt, gray (10YR5/1) to light brownish gray (10YR6/2). Decreased iron oxidation to trace along bedding planes and fracture surfaces. Massive textured, moderately friable. Clay-rich (no silt) from 24.0' to 24.2' and slightly darker color (dark gray: 10YR4/1). Moist, decreasing to very slightly moist from 24.2' to 26.0'. Fissile between 24.5' and 25.7'. Trace black organic material.

CLAYSTONE: Claystone, grayish brown (10YR5/2). Massive texture, weakly friable. Iron oxidation along internal fractures at 26.3' and 27.0'. Very slightly moist.

CLAYSTONE: Claystone, dark gray (10YR4/1). Notable color change. Fissile and friable, trace moisture.

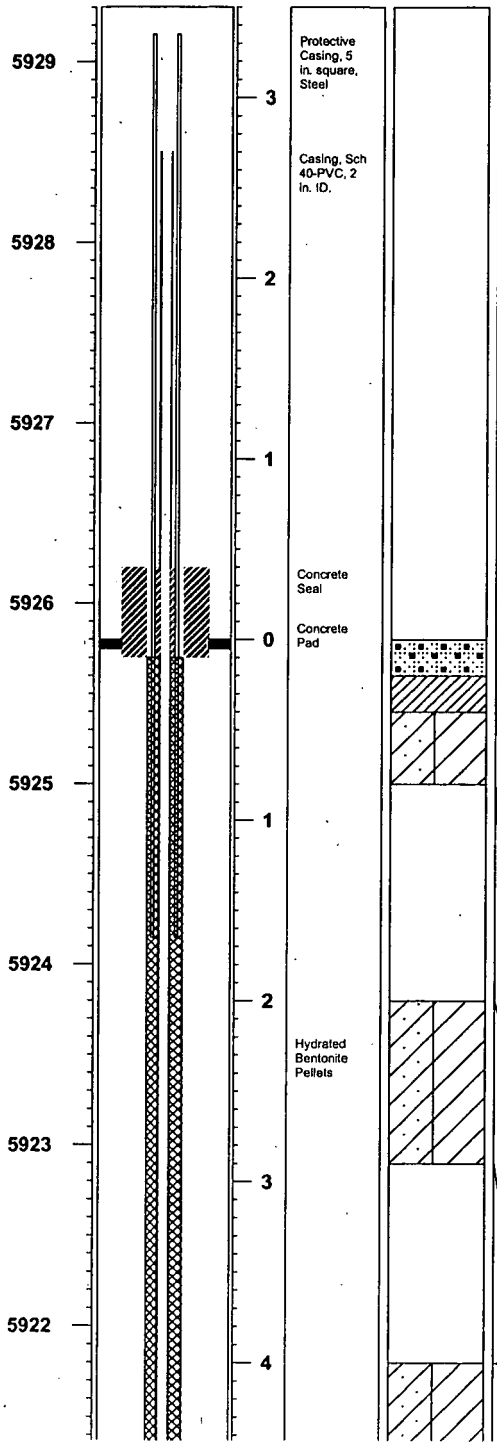
No recovery.

STATE PLANE COORDINATES AREA:
NORTH: 752878.53
EAST: 2084050.53
PROJECT: Present Landfill
REMARKS:

GRND ELEV. (FT): 5925.8
TOTAL DEPTH (FT): 27.7
COMPLETION DATE: 6/27/05
GEOLOGIST: E. Warp

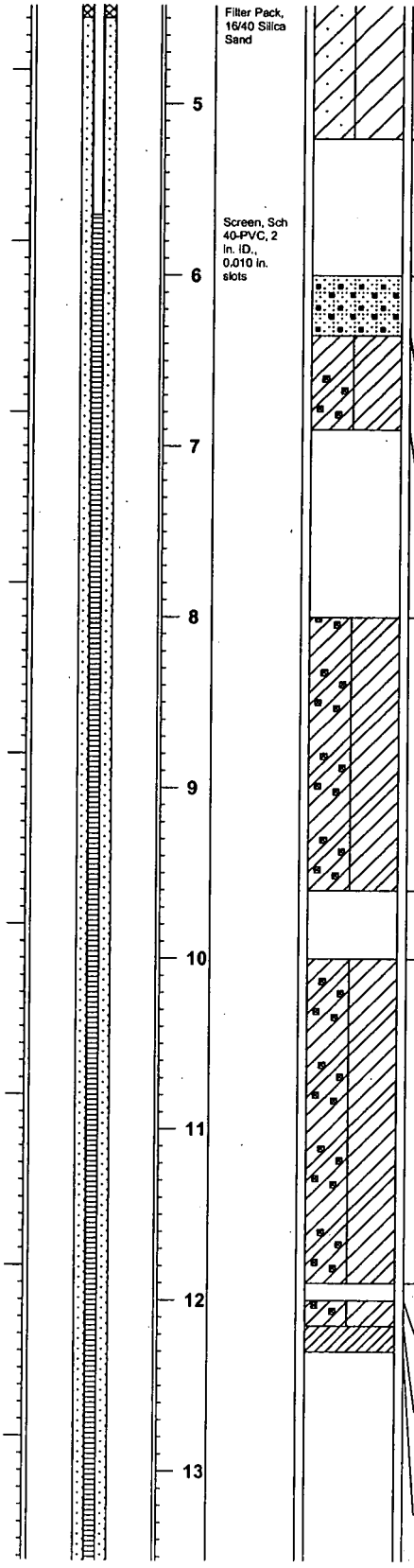
CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 73105



Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
			GP: Gravel (fill), pea gravel (1/4" diameter, subrounded to subangular), composed of granite and quartzite. Poorly graded, dry.
			CL: Clay with trace sand and gravel, grayish brown (10YR5/2) to gray (10YR5/1). Re-worked claystone. Thin black organic stringers common, moist.
			SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR5/6). Imported fill (Qalrf). 60% clay, medium plasticity, 30% sand (medium grained to coarse grained, subrounded to subangular), 10% gravel (1/4" diameter, subrounded to subangular), very moist.
			No recovery.
			SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR4/6). Imported fill (Qalrf). Very similar to interval from 0.4' to 0.8'. 65% clay, medium plasticity, 20 - 25% sand (medium grained to coarse grained, subangular to subrounded), 10 - 15% gravel (1/8" - 1/4" diameter, subrounded, predominately granite and quartzite), saturated, but not flowing.
			No recovery.
			SC/CL: Gravelly, Sandy Clay to clayey, gravelly sand, strong brown (7.5YR4/6). Imported fill (Qalrf). Very similar to interval from 2.0' to

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73105 Lithologic Description	Page 2 of 4



2.9'. 60% clay, medium plasticity, 25% sand (medium grained to coarse grained, subangular to subrounded), 15% gravel (1/4" - 1/2" diameter, subangular, composed of granite, quartzite, and schist), saturated.

No recovery.

GP: Gravel with trace sandy clay, strong brown (7.5YR4/6) clay. Appears to be pea-gravel (possible slough). Gravel (1/4" - 3/4" diameter, subrounded to subangular), poorly graded. Moisture decreases from saturated to moist.

GC/CL: Gravelly, Sandy Clay and shattered quartzite cobble mixture. 45% gravelly, sandy clay, light brown (7.5YR6/4) with 55% shattered cobbles (1/2" to 1-1/2" diameter, angular), moist.

No recovery.

GC/CL: Sandy Clay/Gravel mixture, strong brown (7.5YR5/6) clay. 60 - 70% gravel and cobbles, 20 - 30% clay (medium plasticity), 5 - 10% sand (coarse grained, subangular). Shattered quartzite cobbles from 8.4' to 8.6' (2" diameter) and from 9.2' to 9.5' (2" - 3" diameter). Moist.

No recovery.

GC/CL: Sandy Clay/Gravel mixture, strong brown (7.5YR5/6). 50% clay (medium plasticity), 30% gravel (1/8" - 3/4" diameter, subangular), ~20% sand (coarse grained), moist. Quartzite cobbles (1" - 2" diameter) at 11.2' and 11.7'.

No recovery.

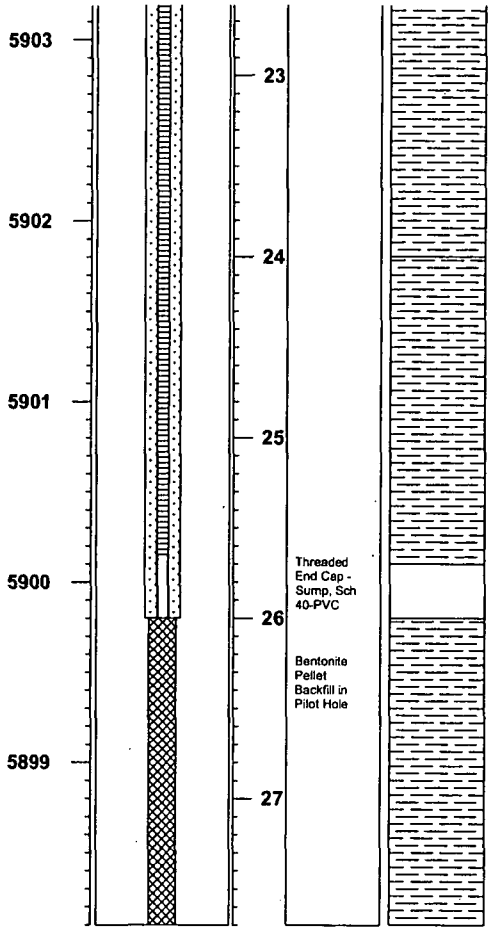
GC/CL: Sandy Clay/Gravel mixture, same as interval from 10.0' to 11.9'.

CL: Silty Clay, gray (10YR6/1). Re-worked silty claystone. Poor recovery due to clogged split spoon sampler producing "ribbons" of claystone. Probable cobble lodged in sampler. Moist.

No recovery.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73105 Lithologic Description	Page 3 of 4
5912		14				
					CLAYSTONE: TOP OF BEDROCK. Silty Claystone (weathered bedrock), grayish brown (10YR5/2) with some yellowish brown (10YR5/6) mottling. Massive texture, firm and cohesive. Weak to moderately friable. Weak iron oxidation mottled throughout. Trace black organic material. Moist. Bedrock contact estimated at 12.5'. Estimated by drilling conditions and changes in penetration.	
5911		15				
					No recovery.	
5910		16				
					CLAYSTONE: Silty Claystone, iron oxidized, yellowish brown (10YR5/4), grading to gray (10YR5/1) at base of interval. Moderate pervasive iron oxidation from 16.0' to 16.3', then decreasing at base. Massive texture, weak to moderately friable. Saturated from 16.0' to 16.2', decreasing to moist from 16.2' to 16.3'.	
5909		17			CLAYSTONE: Claystone with silt, iron oxidized, yellowish brown (10YR5/8). Strong pervasive iron oxidation. Firm and dense, moist. Black organic material common as stringers and along undulating bedding planes.	
5908		18			CLAYSTONE: Claystone with silt, grayish brown (10YR5/2) with some yellowish brown (10YR5/6) mottling. Decreasing overall iron oxidation to weak, mottled. Firm, weakly friable, moist. Black organic stringers common. Faint bedding visible.	
					No recovery.	
5907		19			CLAYSTONE: Claystone with trace to some silt, gray (10YR5/1) with yellowish brown (10YR5/4) mottling. Weak iron oxidation mottled throughout. Firm/dense. Weakly friable. Black organic stringers common. Black carbonaceous material coating bedding planes at 18.9' and 19.0'. Moist.	
5906		20			No recovery.	
					CLAYSTONE: Claystone, light brownish gray (10YR6/2) to gray (10YR6/1). Massive texture, firm/dense. Trace overall iron oxidation. Weak iron oxidation from 21.7' to 22.0'. Trace black organic stringers. Moisture decreases to slightly moist.	
5905		21				
5904		22			CLAYSTONE: Claystone, gray (10YR5/1) to dark gray (10YR4/1).	

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73105 Lithologic Description	Page 4 of 4



Un-oxidized bedrock. Notable color change. Massive texture, firm/dense. Trace black organic material. Moisture decreases to very slightly moist. Abrupt color change at base.

CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Un-oxidized, un-weathered bedrock. Fissile/friable. Black carbonaceous material common. Decreasing moisture.

No recovery.

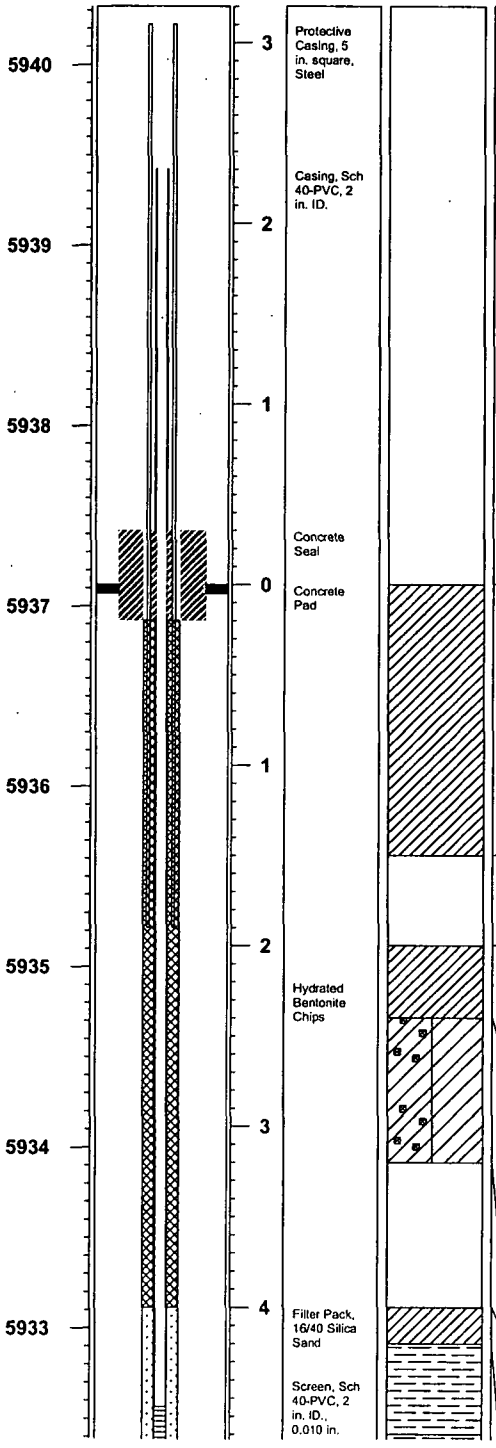
CLAYSTONE: Claystone, dark gray (10YR4/1) to very dark gray (10YR3/1). Un-oxidized, un-weathered bedrock. Fissile/friable. Black carbonaceous material common. Abundant black carbonaceous material from 27.0' to 27.7'. Moisture decreases to trace. Refusal at 27.7'.

STATE PLANE COORDINATES AREA:
NORTH: 752767.53
EAST: 2084218.33
PROJECT: Present Landfill
REMARKS:

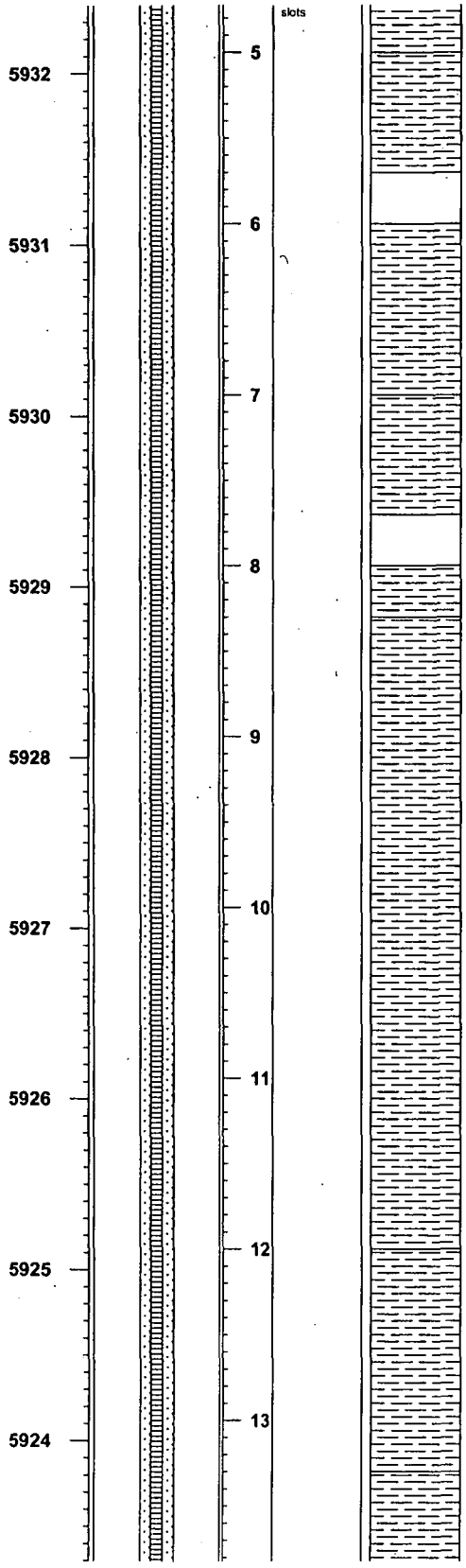
GRND ELEV. (FT): 5937.12
TOTAL DEPTH (FT): 32.0
COMPLETION DATE: 6/27/05
GEOLOGIST: E. Warp

CASING DIA (IN): 2
BH DIA. (IN): 8
GRID LOCATOR:

LOG OF BORING NUMBER: 73205



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		CL: Clay with silt, trace gravel, and trace sand, brown (7.5YR4/3). Medium plasticity and firm. Trace to 3% disseminated caliche. Trace roots. Schist cobble (3/4" diameter, subangular) at 0.3'. Slightly moist to moist.
		No recovery.
		CL: Clay with silt, trace gravel, and trace sand, brown (7.5YR4/4 to 7.5YR4/2). Medium plasticity and firm. Same as interval from 0.0' to 1.5'. Slightly moist.
		GC/CL: Sandy Gravel/Clay mixture, brown (7.5YR4/4). ~75% sandy gravel and ~25% clay. Gravel (1/4" - 1" diameter, subangular to subrounded, predominately quartzite). Sand (coarse grained, subangular). Weak iron oxidation disseminated throughout clay and as coating on 1/4" gravel clasts. Trace disseminated caliche. 2" diameter quartzite cobble at 2.4'. Shattered quartzite cobble from 3.0' to 3.2'. Poor recovery due to cobbles. Slightly moist.
		No recovery.
		CL: Sandy, Gravelly Clay, brown (7.5YR4/4). 5 - 10% gravel (1/4" - 1/2" diameter, subrounded to subangular, predominately quartzite). 5 - 7% sand (coarse grained, subangular). Clay has medium



plasticity. Moisture increases from slightly moist to moist.

CLAYSTONE: TOP OF BEDROCK. Claystone, grayish brown (10YR5/2) to gray (10YR5/1). Firm/dense. Black organic stringers common on undulating bedding planes. 1/4" caliche lense at base of interval. Sharp basal contact, color change. Moist.

CLAYSTONE: Claystone, iron-oxidized/weathered, yellowish brown (10YR4/6). Moderate to strong pervasive iron oxidation. Moderately friable. 1/4" caliche lense at top of interval and as blebs throughout. Moist.

CLAYSTONE: Silty Claystone, gray (10YR6/1). Dinstinct color change. Massive texture. Caliche mottled throughout. Friable. Moisture decreases to very slightly moist.

No recovery.

CLAYSTONE: Claystone, iron oxidized/weathered, yellowish brown (10YR5/6 to 10YR5/4). Weak pervasive iron oxidation. Weak to moderately friable. Trace white caliche stringers. Thin caliche lense at 6.8'. Slightly moist.

CLAYSTONE: Claystone, grayish brown (10YR5/2). Decreased iron oxidation to trace as stringers. Moderately friable. Massive texture. Slightly moist.

No recovery.

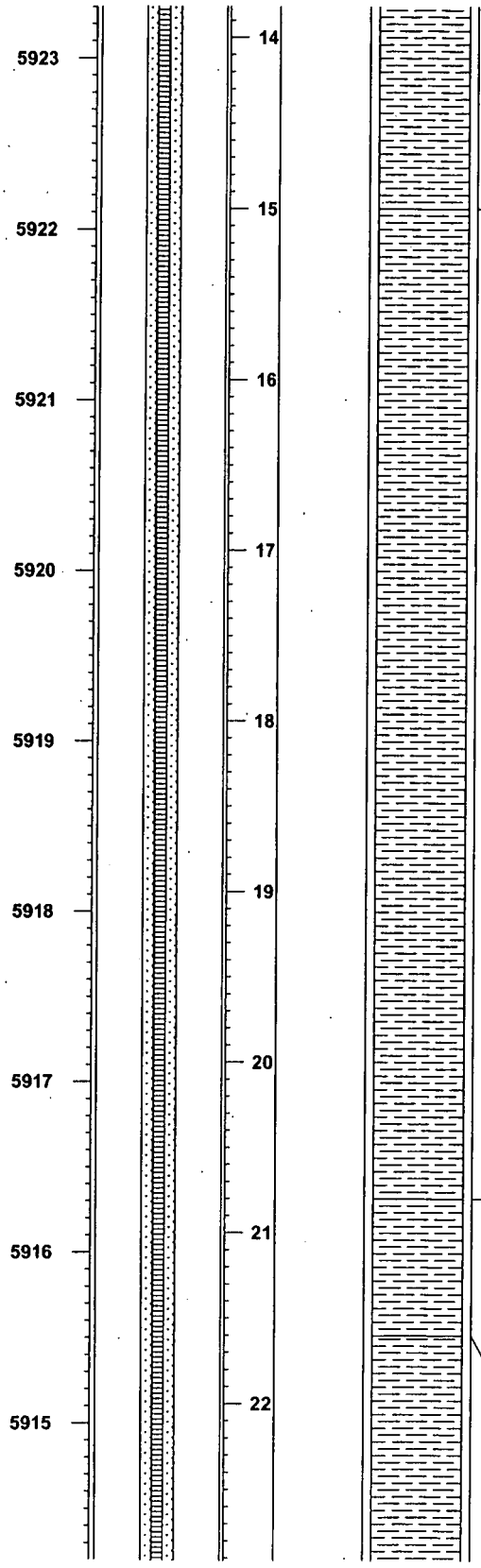
CLAYSTONE: Silty Claystone, iron oxidized, yellowish brown (10YR5/4). Weak to moderate pervasive iron oxidation. Massive texture. Weak to moderately friable. Black manganese oxide (possible organics) bleb at 8.2'. Slightly moist.

CLAYSTONE: Claystone, gray (10YR5/1). Decreased iron oxidation to trace. Massive texture, firm yet weakly friable. Trace black organic stringers throughout. Black organic lense (1/8" thick) at 11.2'. Trace iron oxidation stringers from 11.2' to 12.0'. Moisture decreases to very slightly moist. Hard, cryptocrystalline calcareous clast (~3/8") at 9.9'.

CLAYSTONE: Claystone, gray (10YR6/1). Massive texture, dense/firm, weakly friable. Trace to some iron oxidation. Abundant black organic material from 12.8' to 13.0'. Very slightly moist.

CLAYSTONE: Claystone with silt, gray (10YR6/1). Massive texture as above interval from 12.0' to 13.3'. Un-oxidized bedrock. Trace black organic stringers. Firm/dense. Thin caliche lense along

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73205 Lithologic Description	Page 3 of 4



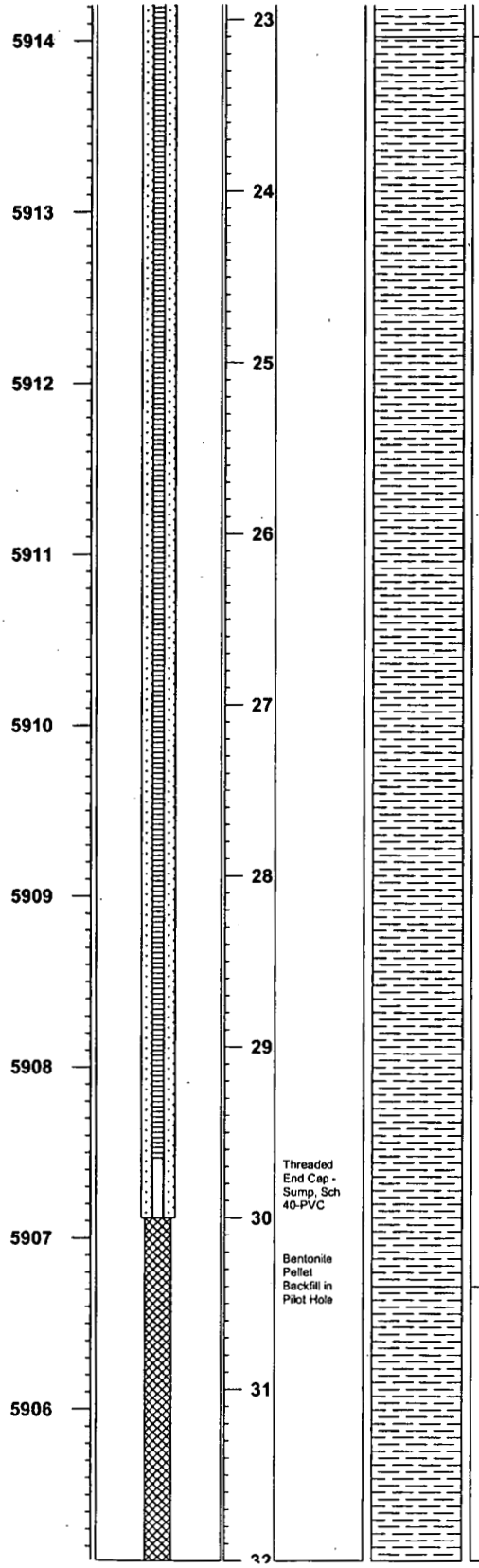
internal bedding plane at 13.7'. Very slightly moist.

CLAYSTONE: Silty Claystone, gray (10YR6/1). Weak iron oxidation along horizontal bedding planes. Predominately massive texture, firm/dense. Trace black organic stringers and blebs. Weak to moderate pervasive iron oxidation from 17.3' to 17.7'. Near-vertical fracture (~80 deg) from 18.9' to 19.5' with iron oxide coating. 1/4" horizontal lense of carbonate (druse) at 19.7'. Interval slightly moist. Occasional sandy intervals at 17.1', and from 17.6' to 17.7'. Claystone interval from 18.8' to 19.1'. Rip-up clasts, iron oxide-replaced organic debris present. Sand is very fine grained to fine grained.

CLAYSTONE: Claystone, grayish brown (10YR5/2). Weak iron oxidation as stringers and along bedding planes. Black organic material along bedding planes. Possible manganese oxide associated with iron oxidation along bedding and fracture surfaces. Dense/firm. Slightly moist.

CLAYSTONE: Claystone, gray (10YR6/1 to 10YR5/1). Trace weak iron oxidation as stringers and along bedding/fracture surfaces. Iron oxidation as fracture (~50 deg) coating at 22.6'. Interval weak to moderately friable. Massive texture. Slightly moist.

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 73205 Lithologic Description	Page 4 of 4



CLAYSTONE: Claystone, dark gray (10YR4/1). Firm/dense. Trace iron oxidation along bedding planes/fracture surfaces. Bedding planes are faintly visible. Trace black organic material along bedding and as clasts (to 1/2" diameter). Slightly moist from 23.1' to 24.2', decreases to trace moisture from 24.2' to 30.4'. Weak pervasive iron oxidation from 29.1' to 29.3'.

CLAYSTONE: Claystone, un- (iron) oxidized/un-weathered, very dark gray (10YR3/1). Distinct color change. Firm and dense. Trace iron oxidation stringers from 31.8' to 31.9'. Sub-horizontal, undulating bedding faintly visible. Black organic material common along bedding planes and as clasts (to 1/2" diameter). Trace moisture.